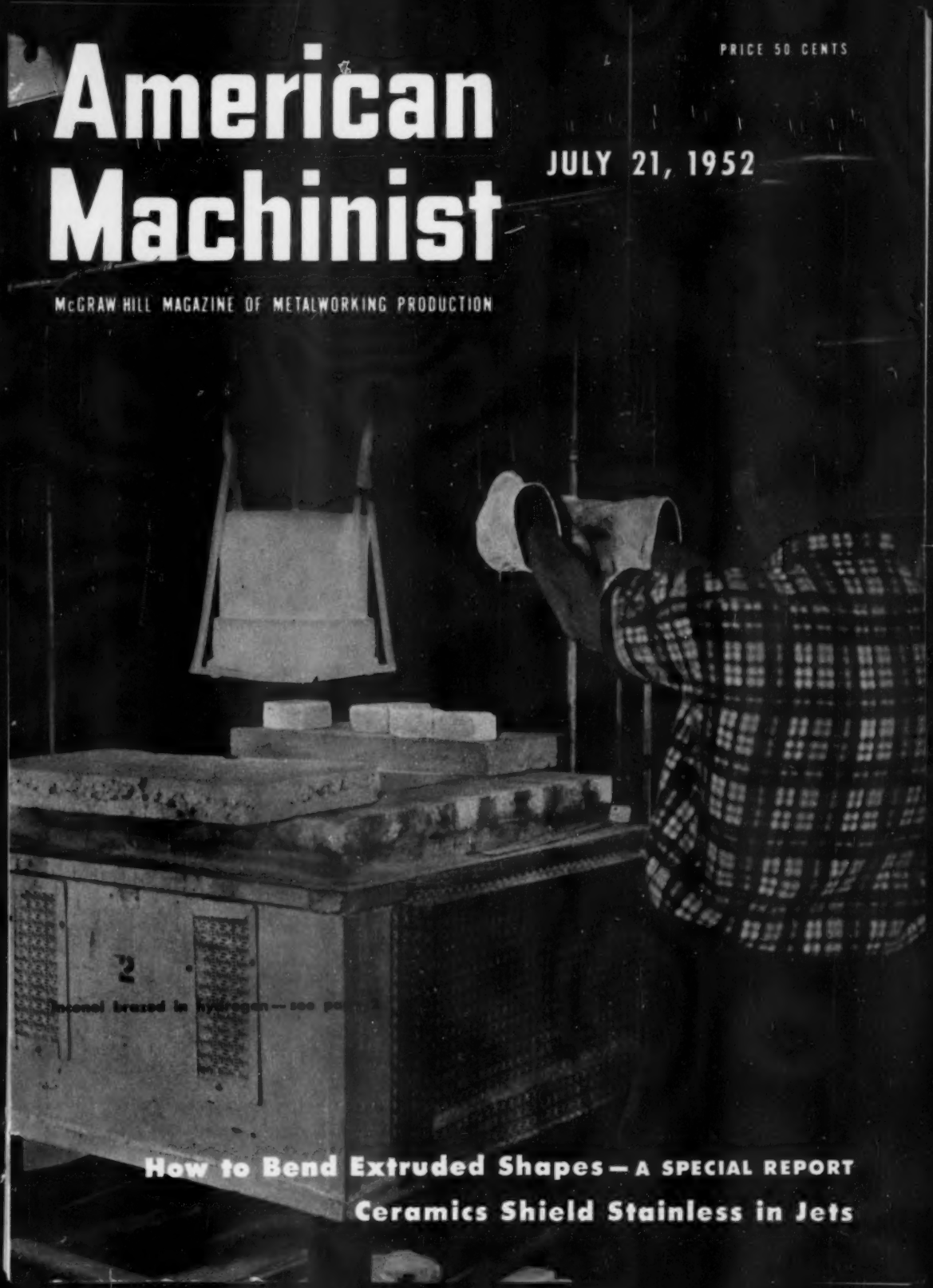
PRICE 50 CENTS

American Machinist

JULY 21, 1952

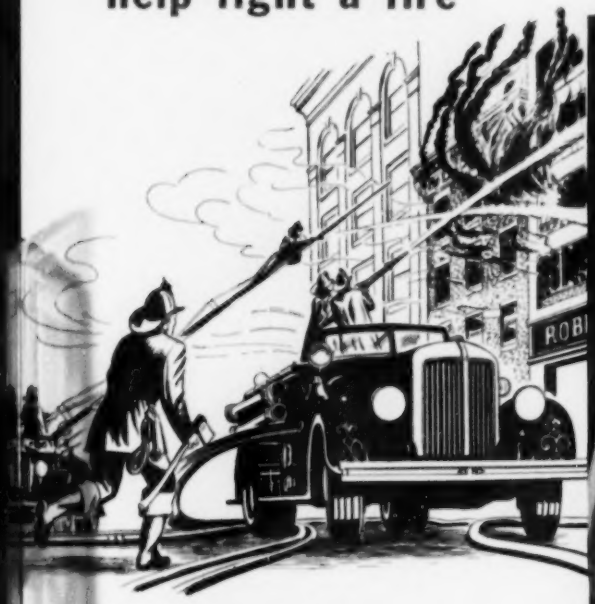
McGRAW HILL MAGAZINE OF METALWORKING PRODUCTION

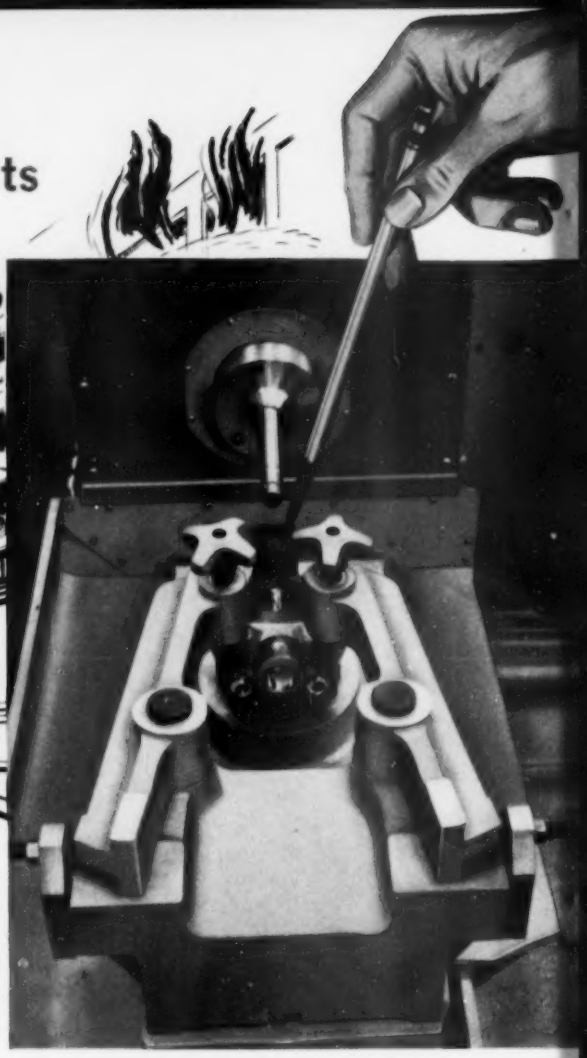


How to Bend Extruded Shapes — A SPECIAL REPORT

Ceramics Shield Stainless in Jets

Here's How Heald precision finished parts help fight a fire





Heald Bore-Matic speeds precision production of steering knuckles for fire trucks

● Whether it's a major disaster or a grass fire in Farmer Brown's pasture, fire-fighting equipment must be ready to roll anywhere on a moment's notice. Here extra dependability and precision manufacture are vital. And that's where Heald fits into the picture.

The installation shown above, for example, is used to precision borize steering knuckle assemblies for fire trucks. This Heald Model 221 Bore-Matic is arranged to permit a choice of two borizing methods — either by boring both bushing holes simultaneously with a double-tooled quill; or by boring the front hole first, with a jump cam for rapid traverse between holes. The work is clamped and located in an easy-loading platen type fixture which accommodates several different sizes of assemblies. The result — a high precision, high production operation that helps assure a continued flow of essential equipment.

Remember — when it comes to precision finishing, it pays to come to Heald.

HEALD

Heald machines speed the nation's production

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American Machinist

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CONTENTS for JULY 21, 1952

VOL. 96, No. 15

ADMINISTRATION

Editorial ..... *Burnham Finney* 97
Merit Inventory ..... *Round Table* 123

SPECIAL REPORT

How to Bend High-Strength Extruded Shapes ..... *F C Hoffman* 115

ENGINEERING

How High Vacuum Aids Metalworking ..... *Frank Charity* 102
How Draw Speed Affects Stainless Wire ..... *Samuel Storchheim* 124
Gravity Bearings Support Idler Gear ..... *R Mery* 127
Checking Noisy Machinery ..... *Fred Lettino* 127

CASTING & MOLDING

How Aluminum Bonding is Keyed to Production .. *Wm M Stocker, Jr* 108

FINISHING

Ceramics Shield Stainless for Jets ..... *Robert G Hicks* 99
Ceramics Make Furnace Fixtures Last Longer ..... *D K Krosch* 101

HEAT-TREATING

Induction-Hardened Gears Show Little Distortion ..... *L G Miller* 141

INSPECTION & TESTING

Magnets Find Balance of Flywheels ..... *A H Poole* 127
Button Block Locates Holes ..... *J C Magee* 129
Pin Measurement for Involute Gears VI, VII, VIII (RBS) *R E Rawling* 133
Plastics Make Inspection Crystal Clear 140

MATERIAL CUTTING, FORMING

Special Setups Speed Production of 20-MM AP Shot .... *F N Beede* 112
Disk-Grinder Conveyor Mass-Finishes Castings .... *Joseph F Budnick* 126
Partly Threaded Strap Has Clamping Flexibility ..... *Allan Clarke* 126

TOOLING

Compound Dies Blank, Pierce and Form in Multiple *Wm M Stocker, Jr* 104
Simplified Arbor Collars ..... *A Vetsch* 127
Bracket Locks Without Marring Shaft ..... *L Kasper* 127
Clamping Die Forms Round Springs ..... *T H Hsu* 127
Die-Filler Blocks Support Thin Punch Wall ..... *F C Elmo* 128
Half Screw Clamps Jaws Rapidly ..... *R J Dodson* 128
Rubber Roller Clears Saw Chips ..... *Leonard T Smith* 128
Precision Lathe Feed Uses Compound Angle ..... *Franklin Rieske* 129
Cutoff-Tool Holder Has No Overhang ..... *Max Karfunkel* 129
Setup Block Works on Lathe on Grinder ..... *Sam Winston* 129
Special Broached Collet Holds Two Stocks ..... *Bernard A Rogers* 130
HSS Form Tools Salvaged by Regrinding ..... *A E Salmons* 130
Lathe Saddle Works Like Turret ..... *S Taylor* 130

NEWS OF METALWORKING

Spot News 83
Washington 85
Detroit 87
Machine Tools 89
Gaging Metalworking 93
Names in the News 146

DEPARTMENTS

Backlash 76
Reference Book Sheets 133
Talking Shop 139
Subcontracting News 147
Equipment, Materials, Parts 150
Free Literature Available .. 155
Round Table Discussion 174
New Books 208

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Chips and QUIPS

Hydrogen Brazing . . . Sylvania needed a sensitive mass spectrometer for its Physics Lab, to detect minute traces of elements in basic research. One way to obtain such a tool is to make it. That meant some tricky manufacturing. Fairly large and heavy pieces of Inconel (high-chrome stainless) had to be assembled to make the vacuum envelope. High-temperature brazing was mandatory, because non-magnetic materials must be used, the inside must be free of oxides, joints must hold a very high vacuum, and the assembly must be able to withstand periodic baking out at 600 to 900F.

The longer the cooling time, the more danger of oxide inclusions and poor brazes. At a dewpoint of −130F, difficult to obtain for fairly abundant gas flow, cooling should be about 30 min. A lab pit furnace was converted for the job. Heavy-gage stainless was formed into a cylindrical retort to fit in the furnace, with a sand seal on the bottom and two long tubes welded to the top for introduction and burning of the hydrogen. The retort, as shown in our cover Ektachrome, is heated to desired temperature (about 2100F for pure OFHC copper brazes), then lifted and carried to a cooling rack where its temperature is reduced rapidly to a few hundred degrees by water—fog sprays and cooling coils. Larry Ankersen, Lab. photographer, took the picture.

NTDMA . . . Current article in our series of NTDMA dies is the result of an interview with Glen Pfister, president, A-G Tool & Engrg Co, Cincinnati. It describes a compound die for a spice-can cover, which replaced a simple die to push output up a big percentage.

Bending Extrusions . . . Our current Special Report deals with precision bending of high-strength-alloy extrusions for new combat planes. There's a trick to it, which F C Hoffman, of Lockheed Aircraft in Burbank, Calif, explains. The press is a standard hydraulic unit with a double-acting bending die and temperature controlled to hold work at 300F ±25°. Jobs that took 30 min. now are done in 3. The die is universal, so inserts only are changed to suit cross-section, and compound bends are produced in a single stroke. Lockheed is now building a special bender for the job.

Armor Piercing . . . Frederick N Beede, genl supt of Pantex Mfg Corp, Pawtucket, RI, describes special setups and equipment for making 20-mm armor-piercing shot in one of five armament-production articles in this issue. This one shows automatic induction hardening, automatic Magnaglo inspection, special grinding and other machining . . . Another in the group shows in pix (including a floor layout) how Continental Motors bonds a steel barrel to aluminum cooling fins to produce tank-engine cylinders. After the bonding, there's machining to be done, too . . . If you were wondering, the other three defense stories are the ones on ceramics and the Special Report.

Ceramics . . . At long last, we've gotten Robert G Hicks, project engineer of the South Wind Div, Stewart-Warner, to set down for us the latest data on how ceramic coatings shield stainless parts for turbojets. Details are in our lead article, including the frits used, the process, characteristics of various ceramic materials, and so on. This one required approval by both the Bureau of Standards, source of the frit formulas, and the Dept of Defense.

Stainless . . . Experiments in drawing 18-8 stainless wire showed that draw speed affected properties of the wire—and might similarly affect stainless sheet in deep drawing. Samuel Storchheim, senior metallurgical engr of Sylvania Electric Products, tells about it, gives tables and graphs

Coming . . . Aug 4 *AM* will give you more on stainless, 11 pages on machining and 5 on polishing and finishing, combined into a Special Report. There'll be a cover showing high-speed machining, stories on gages for grinding, on electric-truck maintenance, optical inspection of turbine blades, shop kinks at Douglas Aircraft, and three or four interesting shorter articles.

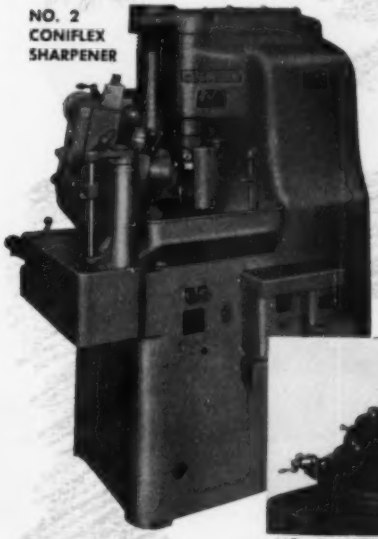
HOT FORMER . . . F C Hoffman has a distinction as a Californian—he was born there. His early schooling included automotive engineering, and he operated his own business in that field until 1939. Then he joined Lockheed. A year of training in fabrication and a year of contact engineering, plus four evenings a week for both years at night school, put Mr Hoffman at the head of a new committee to study and work out metal-forming problems at Lockheed plants in 1941. He also supervised a group of production-design development engineers for three years. He left Lockheed late in 1945 to do special metal design, returned in 1947 to specialize in hot-forming developments in the Manufacturing Research Group. Now he's specializing in hot forming of magnesium, 755 aluminum, and titanium. He authored our current Special Report on bending extruded shapes.

SMALL CONIFLEX® GEARS

NO. 2
STRAIGHT BEVEL GENERATOR

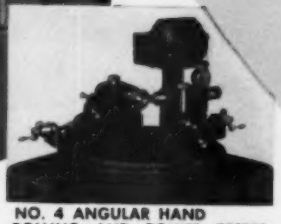
Coniflex® gears in the smaller sizes are cut on the Gleason No. 2 Straight Bevel Generator. Like the larger Coniflex® gears, these gears are cut to the same fine degree of accuracy with operating tolerances which make them easier to assemble and smoother to operate. Gears cut on the No. 2 have a localized tooth bearing that insures the proper bearing position during operation. When production demands require it, the No. 2 can be equipped with an automatic loader.

NO. 2
CONIFLEX
SHARPENER



The No. 2 Coniflex® Sharpener is a specially designed wet-type grinder to handle the disc type interlocking cutters used on the No. 2 Straight Bevel Generator. The cutter oscillates under the grinding wheel and is indexed automatically until all the blades have been sharpened.

For testing of the running qualities of small Coniflex® gears the Gleason No. 4 Angular Hand-Rolling and Power Tester, is the machine to complete the unit for small bevel gear production.



NO. 4 ANGULAR HAND
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BUILDERS OF BEVEL GEAR MACHINERY · GLEASON · FOR OVER EIGHTY-FIVE YEARS ·

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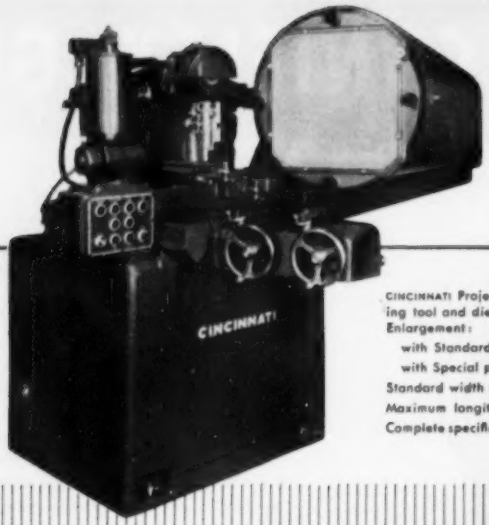
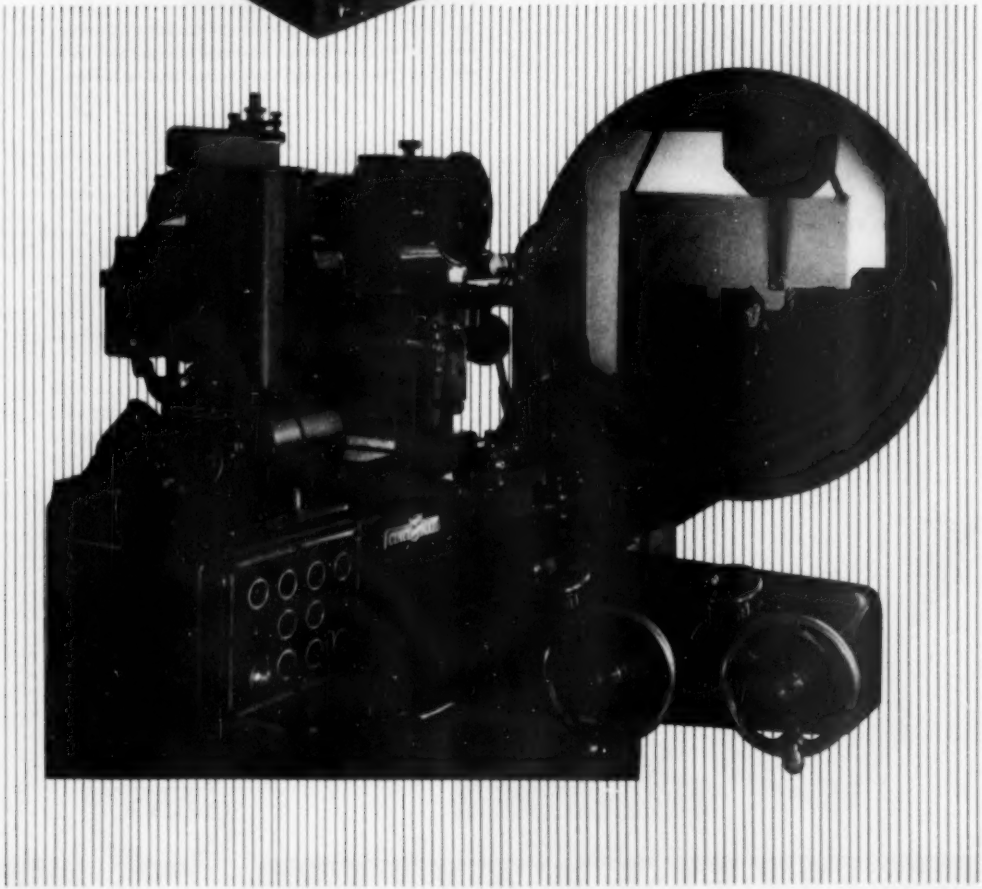


CINCINNATI Projecto-Form, for accurately grinding tool and die parts.
Enlargement:
with Standard projection lens 20X
with Special projection lens 40X
Standard width of grind, one setting .... 9/10"
Maximum longitudinal adjustment ..... 4½"
Complete specifications in catalog No. M-1612-3.



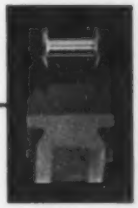
PROJECTO-FORM

Gives you a ringside seat of accuracy in the making

Like television, CINCINNATI Projecto-Form Grinding Machines eliminate a lot of intermediate steps and show you exactly what's happening at the point of action. Through an arrangement of lenses and a mirror, an intense light projects a silhouette of the work and wheel to a ground glass screen in front of which the operator is seated. A "drawing" of the desired contour, twenty times size, is cut on a glass plate coated with a tinted translucent emulsion. Mounted on the viewing screen, the drawing furnishes a guide to which the operator works. With two micrometer adjusting handwheels, he adjusts the wheelhead vertically and transversely while the grinding wheel reciprocates over the work. Grinding continues until the image of the work matches the drawing. ¶ The Projecto-Form method of grinding greatly reduces the cost of producing accurate form tools, die parts, and others. Illustrated at the right are typical examples, and the time saved over previous methods. You may obtain complete specifications by writing for catalog No. M-1612-3.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

60%



Projecto-Form reduced the time to grind this form tool by 60%.

70%

Only four hours' grinding time required on the profile of the die for this part—30% of the former time.

68%

Entire contour of blanking punch ground by the Projecto-Form method. Time reduced by 68%.

CINCINNATI

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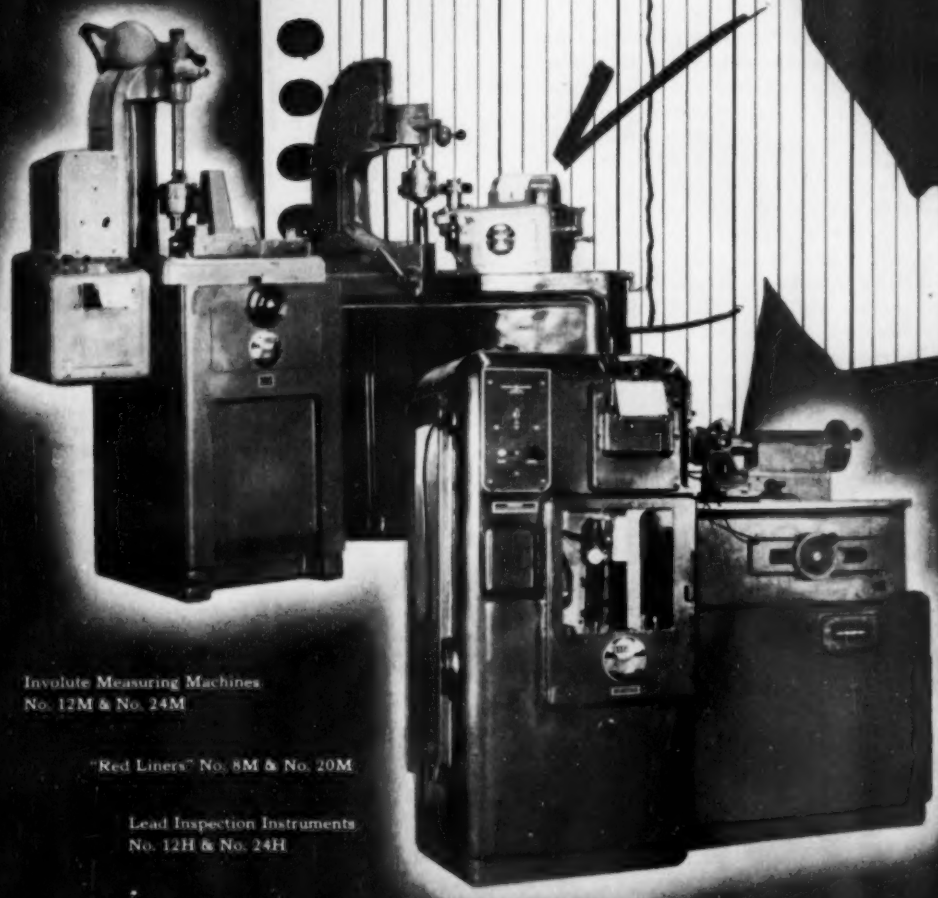
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Gear Inspection...



Involute Measuring Machines
No. 12M & No. 24M

"Red Liners" No. 8M & No. 20M

Lead Inspection Instruments
No. 12H & No. 24H

to reduce "Inspector" fatigue

Fellows
Inspection Instruments
automatically record errors
in gears on a
permanent paper chart

Fellows Recording Inspection Instruments provide a dependable means for controlling gear accuracy, and at the same time eliminate monotonous inspection routine. Charted inspection records, whether for temporary use or permanent filing, magnify errors 200 times, and indicate their location, nature and magnitude.

These instruments include: The Involute Measuring Instrument for checking tooth profiles; The Lead Measuring Instrument for checking tooth surfaces relative to gear axis, such as helical surfaces, taper and crowning of gear teeth; and the famous RED LINER for recording all errors in combination, closely resembling that of actual operating conditions.

For details on any or all of these instruments write, wire or phone the Fellows Office nearest you.

The sensitivity of Fellows Recording-type Inspection Instruments combines accuracy with ruggedness of construction.

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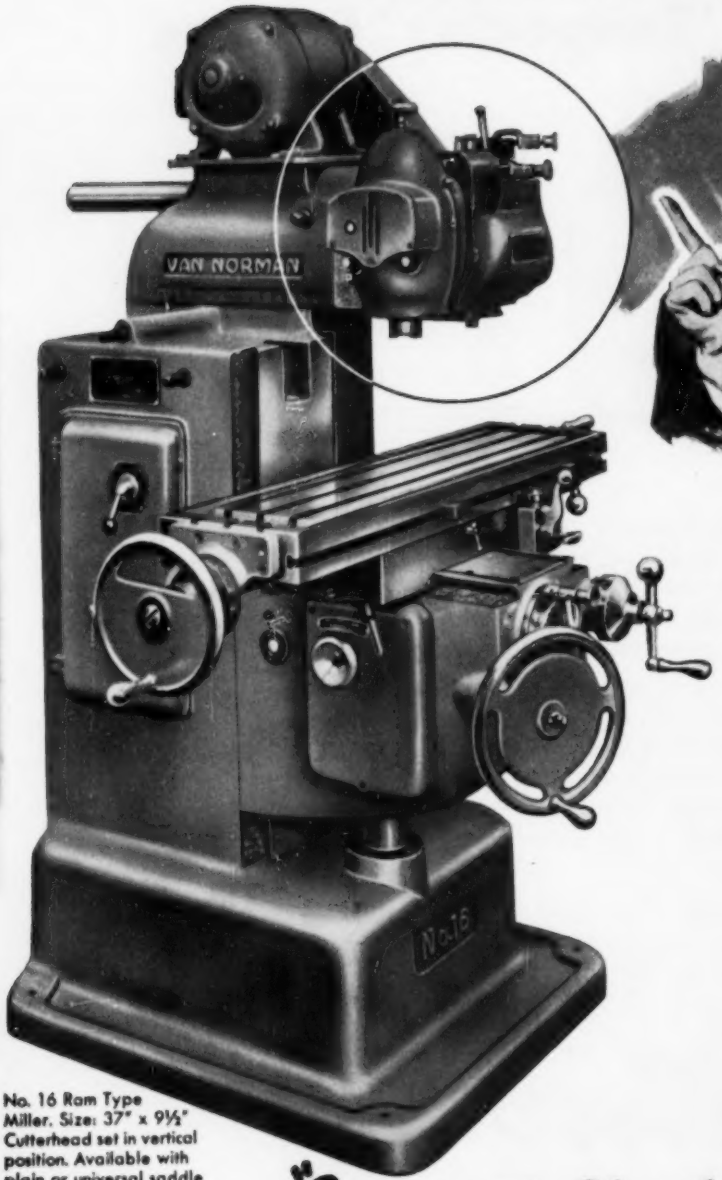
"See what the



No. 16 Ram Type Miller. Size: 37" x 9½" Cutterhead set in vertical position. Available with plain or universal saddle

"It pays to Van Normanize"

Adjustable Cutterhead

Can Do For You...

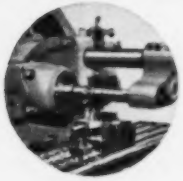
...and you will buy VAN NORMAN Ram Type Millers"

Van Norman Ram Type Millers give you every advantage for reducing milling costs. The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The movable ram plus the saddle cross feed increases the work range and capacity of these millers . . . enables you to handle larger work pieces with ease.

There is no waiting for single purpose machines because practically all milling operations can be accomplished on one Van Norman Ram Type Miller.

Whether it is for tool room, production line, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers will increase your production and cut costs.

Here's how one Van Norman Ram Type Miller does the work of three single-purpose machines.



HORIZONTAL MILLING

With the cutterhead locked in horizontal position, the Van Norman Ram Type Miller is used for horizontal milling operation. Hardened stop set at the factory assures positive 0° setting.

VERTICAL MILLING

The illustration above shows the Van Norman Ram Type Miller as it is used for a vertical milling operation. Permanently fixed hardened stop permits easy, accurate positioning of the cutterhead at 90°.

ANGULAR MILLING

Here the adjustable cutterhead is set at 45° angular milling position. Horizontal, vertical or angular milling. All are easily performed on the Van Norman Ram Type Miller.

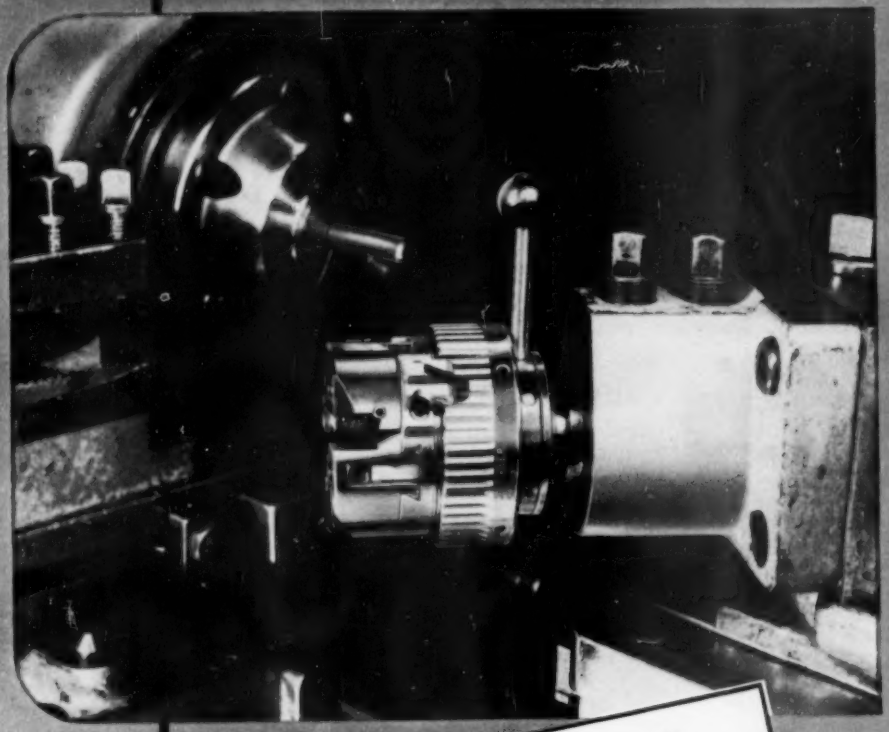
Van Norman Ram Type Millers are available in 6 basic models — No. 12, Table: 37½" x 9⅛"; No. 16 Table: 37" x 9½"; No. 22 Table: 45" x 10"; No. 26 Table: 58" x 13"; No. 36 Table: 64" x 14"; No. 38 Table: 64" x 14".

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

ANNOUNCING The IMPROVED

• POSITIVE
• MORE RIGID



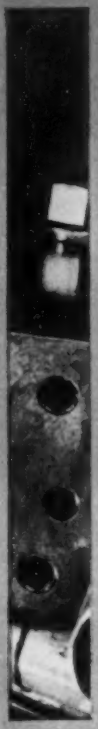
LANDIS Machine company

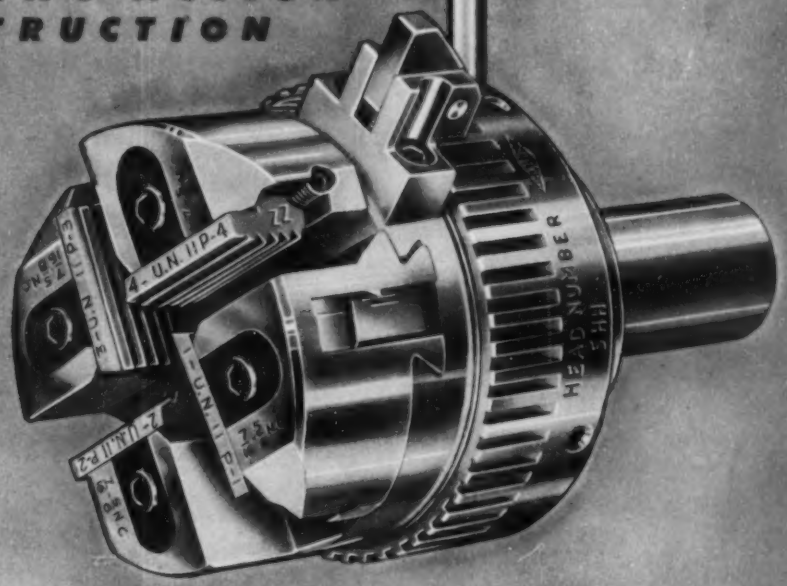
WAYNESBORO, PENNSYLVANIA, U. S. A.

THE WORLD'S LARGEST

5/8" LANDMATIC HEAD

LOCKING ACTION CONSTRUCTION





AN improved *LANDMATIC* Hardened and Ground threading head has been designed for use on turret lathes, hand-operated screw machines, and automatic screw machines employing a stationary head. The 5HH *LANDMATIC* is a stationary self-opening head, and will produce threads ranging from ¼" to ⅝" in diameter. Its construction features two important improvements in design—a positive locking action, and greater head strength.

The positive locking action is provided by a new size-adjustment mechanism. A pivoted latch is held in engagement with notches on the adjustment ring by spring tension. A movement of one notch makes a corresponding adjustment of .001" on the pitch diameter of the workpiece.

The greater overall strength of this die head results from the increased thickness of the head body and its various parts. The new design allows this small die head to easily withstand the extreme stresses imposed when threading special alloy steels.

The 5HH *LANDMATIC* Head has a notably small number of working parts. All parts are made of special alloy steel, and are hardened and precision ground. Left-hand threads may be cut by using left-hand chaser holders and regrinding the same set of chasers. More information available on request.

EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

New Landis Plain Grinder..

Landis Type CHW Plain Grinder

Designed for large volume production

This new LANDIS Plain Grinder has been designed to meet the demand for large scale production, as well as maintenance grinding of large diameters.

Wide carriage ways are provided to give the extra stability required for the work carrying parts of high swing precision grinders. All controls are raised and grouped for convenient operation.

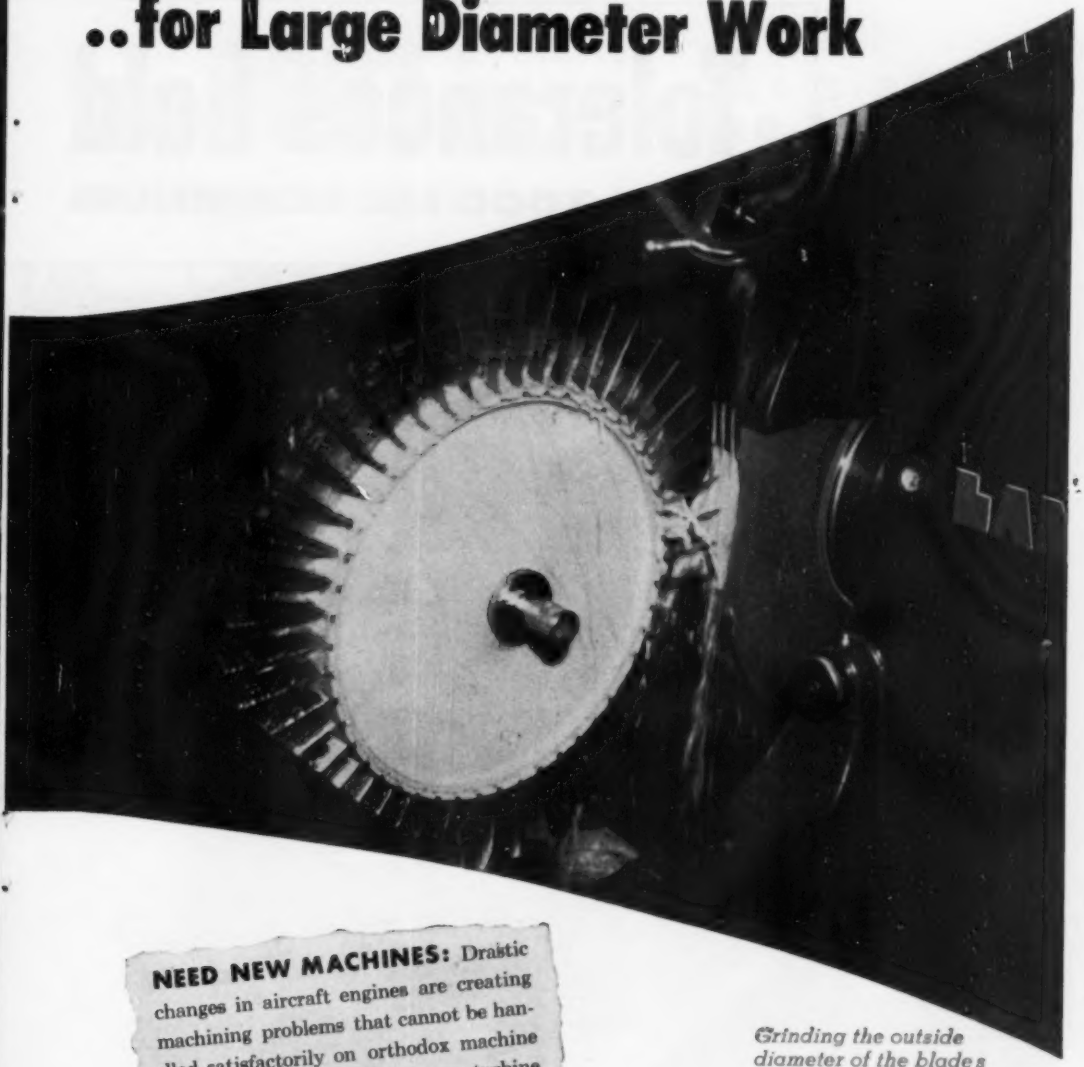
For any help you need on such grinding problems, consult Landis Engineered Grinding Service. We will be glad to give production estimates and tooling recommendations on the basis of your blueprints.

LANDIS
precision grinders

sizes available (Swing and Length between centers)

24" x 48"	30" x 48"	36" x 48"	48" x 48"
24" x 72"	30" x 72"	36" x 72"	48" x 72"
24" x 96"	30" x 96"	36" x 96"	48" x 96"
24" x 120"	30" x 120"	36" x 120"	48" x 120"

..for Large Diameter Work



Grinding the outside diameter of the blades on a 30" jet turbine rotor.

NEED NEW MACHINES: Drastic changes in aircraft engines are creating machining problems that cannot be handled satisfactorily on orthodox machine tools. The new axial-flow gas-turbine engines call for production techniques unlike those encountered in building reciprocal engines or centrifugal-type turbojets. Among the new problems is that of machining a wide range of components of large diameter and thin wall section.

From a recent editorial in Steel magazine.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Tolerances held

ON 3,000 LB. ALUMINUM

Final machine finishing on upper component of large helicopter rotor hub on a G.L. 350-T

GIDDINGS & LEWIS

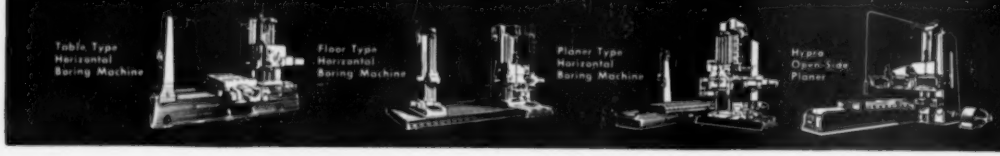


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hydro Open-Side Planer

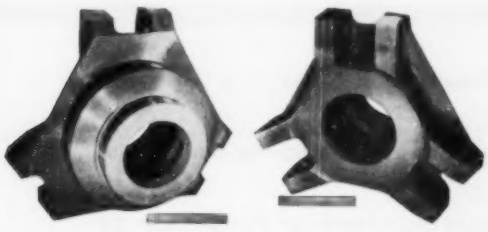
to .0007 in.
ALLOY FORGING

IT takes a versatile tool to machine a 3000 lb. aluminum alloy forging down to a finished weight of 250 lb. — especially when many of the dimensions must be held to a tolerance of .0007-in.

But Magna Mill Products, South Gate, Calif., was ready when orders came to produce the lower components of a huge rotor hub to be used on the largest helicopter ever designed. Three Giddings & Lewis 350-T Horizontal, Boring and Drilling Machines did the rough and finish machining after a band saw had removed excess metal. These G&L's handle awkward machine workpieces like the rotor hub components — and at the same time perform the most precise machine operations.

It is this kind of versatility and precision — on big or little jobs, simple or complex — that saves time and money for users of G&L Horizontal Boring, Drilling and Milling machines.

But whatever you need, don't miss the opportunity to get a free G&L 5-Point Job Analysis. There is no obligation — and DELIVERY ON G&L MACHINES MIGHT BE BETTER THAN YOU THINK!



Two views of the lower component of the helicopter's rotor hub after production had been completed. The aluminum alloy forging for this part weighed 3000 lb. while the finished part weighed approximately 250 lb. Note the complexity of the part, in which many of the dimensions must be held to a tolerance of .0007 in.

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

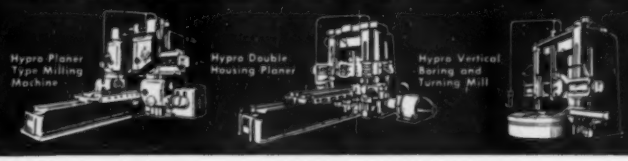
5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

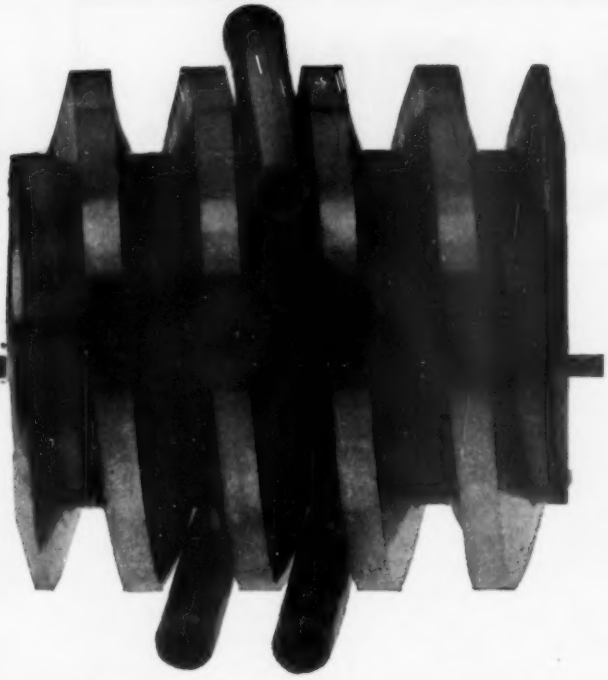
MACHINE TOOL CO.



G&L HYPRO

FOND DU LAC
WISCONSIN

Van Keuren



THREAD MEASURING WIRES

are standard equipment everywhere

The illustration shows .2574" diameter Flush wires in a 29° worm having 2 threads per inch.

Flush wires may be used on Single start worms having lead angles not over 5°.

For Multiple Start worms having lead angles greater than 5°, use the Van Keuren screw thread tables which give the Exact Best Size wire and the Exact measurement over the wires.

You can get Van Keuren measuring wires for every purpose—Worms, Spline Gears, Standard and Special screw threads.

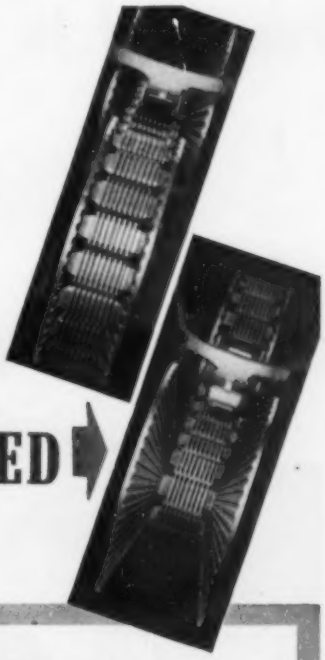
Write for your copy of the VAN KEUREN 1952 Catalog and Handbook No. 35

THE Van Keuren CO.,
173 WALTHAM STREET, WATERTOWN, MASS.
33rd YEAR
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

Only **the P.I.V. variable speed drive has tooth-grip action... from**

MAXIMUM SPEED to MINIMUM SPEED

with an infinite number of positive settings



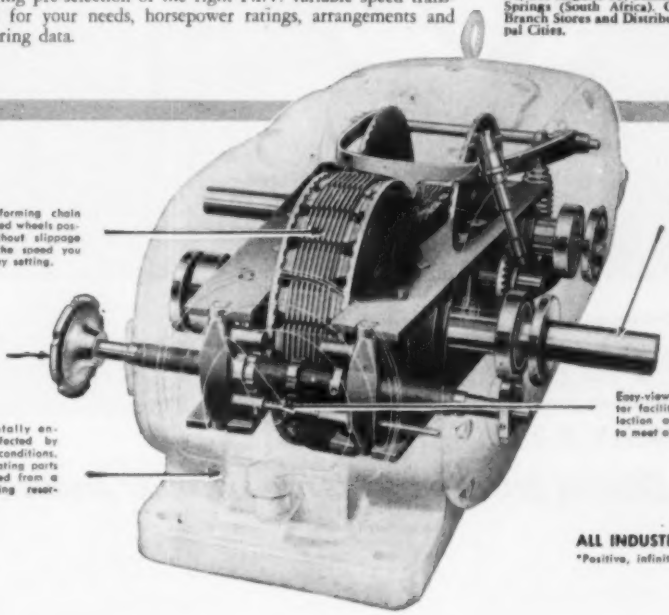
Only Link-Belt's P.I.V. delivers *positive*, stepless speed changing independent of friction . . . because only Link-Belt's P.I.V. has the self-tooth-forming chain that makes this possible. Your nearest Link-Belt branch office can show you how to increase the efficiency and flexibility of your machines, and supply complete information —covering pre-selection of the right P.I.V. variable speed transmission for your needs, horsepower ratings, arrangements and engineering data.

LINK-BELT

P.I.V. VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.

12,200



Self-tooth-forming chain grips toothed wheels positively without slippage — gives the speed you need at any setting.

You can get minute speed changes and maintain them accurately while operating under full load.

An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.

Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.

All-metal, totally enclosed — unaffected by atmospheric conditions. All vital operating parts splash-lubricated from a common housing reservoir.

ALL INDUSTRY USES P.I.V.*

*Positive, infinitely variable

For more

you have a wide

NORTON
ABRASIVES

Making better products to make other products better

efficient surface grinding at lower cost

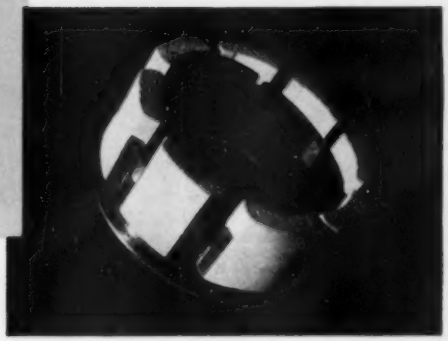
choice of *Norton wheels, cylinders, segments*

Choose Norton ALUNDUM* abrasives for surface grinding high-speed steels, #400 series stainless steels, carbon steels, alloy steels, annealed malleable iron and the tough bronzes. There are five types of ALUNDUM abrasives available — 19 ALUNDUM, the revolutionary 32 ALUNDUM, 38 ALUNDUM, 57 ALUNDUM and Regular ALUNDUM. First choice in solid wheels or segments, particularly where rapid stock removal is an important factor, is 32 ALUNDUM abrasive which has the unique property of a nubbly grain shape and exceptional point endurance.

Choose Norton CRYSTOLON* abrasives for surface grinding hard cast iron, chilled iron, #300 series stainless steel, brass, soft bronzes, aluminum, rubber, and hard facing alloys. The first choice for grinding all of these materials is hard, sharp 37 CRYSTOLON abrasive.

Norton Bonds for surface grinding include vitrified, silicate and resinoid. For use with the ALUNDUM abrasives, Norton Research has developed a special vitrified bond known as "BE".

NORTON COMPANY, Worcester 6, Mass. Warehouses in 5 cities. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.



Step up your production with this Norton chuck and segments

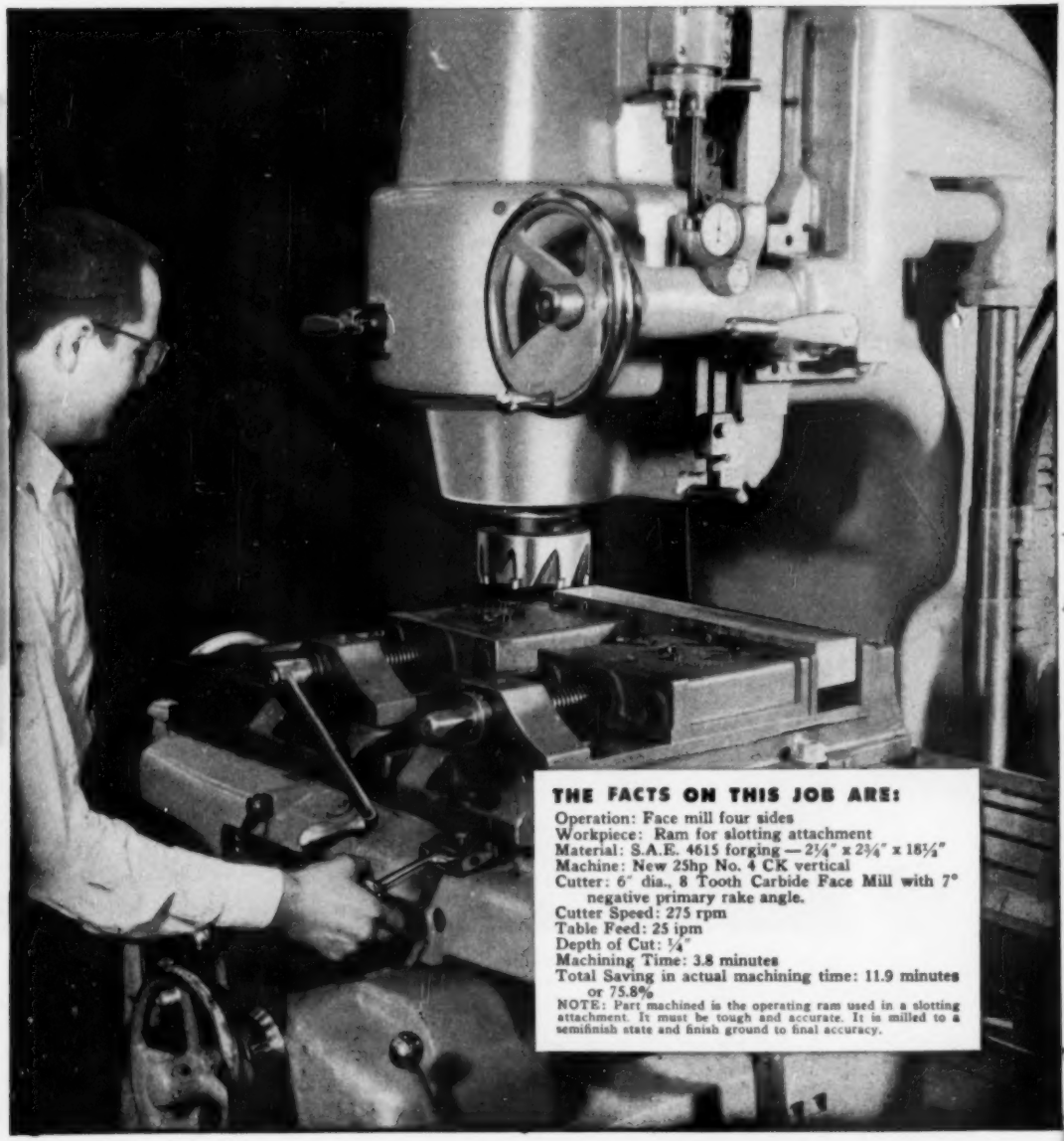
Use on vertical spindle surface grinders where contact is broad. Replace the cylinder wheel with a Norton chuck and segments. Can be mounted without machine alterations. Segments can be changed or adjusted without removing chuck. Gives faster cutting action — lower rate of wear.

See Your Norton Distributor

For the *right* abrasive, the *right* bond, the *right* structure for your surface grinding jobs, see your Norton Distributor. He will be glad to show you how to get the best results in grinding, consulting directly with a Norton Abrasive Engineer should additional advice be necessary. Ask him, too, for your copy of the brand new Booklet 1632, "The ABC of Surface Grinding" — or write us direct. Contains 88 fact-filled pages of helpful information.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

facts tell the story { NEW CUTS



THE FACTS ON THIS JOB ARE:

Operation: Face mill four sides
Workpiece: Ram for slotting attachment
Material: S.A.E. 4615 forging — 2¼" x 2¾" x 18¾"
Machine: New 25hp No. 4 CK vertical
Cutter: 6" dia., 8 Tooth Carbide Face Mill with 7° negative primary rake angle.
Cutter Speed: 275 rpm
Table Feed: 25 ipm
Depth of Cut: ¼"
Machining Time: 3.8 minutes
Total Saving in actual machining time: 11.9 minutes or 75.8%

NOTE: Part machined is the operating ram used in a slotting attachment. It must be tough and accurate. It is milled to a semifinish state and finish ground to final accuracy.

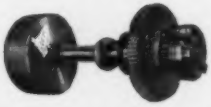
KEARNEY & TRECKER MILWAUKEE CK MILLING MACHINE PRODUCTION TIME 75%

4615 ALLOY STEEL FORGING MILLED IN 3.8 MINUTES . . . FORMER TIME 15.7 MINUTES

C-K MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER

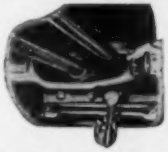
Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

New CK machines have Greater Horsepower. On this job, 25hp permitted operator to get maximum production from his modern cutter.

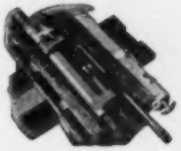


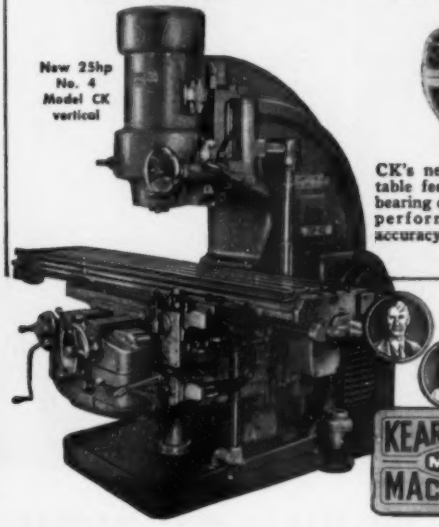
CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.

The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from ⅛" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.



CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed performance and sustained accuracy.





New 25hp No. 4 Model CK vertical

It will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results—greater machine capacity, productivity and better finished products. So, for the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

POWERED FOR

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER

PRODUCTION

WARNER & SWASEY Saddle Type Turret Lathes deliver tremendous power for the toughest jobs. The one-piece bed, with integrally cast head and VEE-WAYS, carries massive solid weight at the right places. And with diagonal cross-ribbed reinforcing it insures the rigidity that holds accuracy.

You can really hog off tough metal *fast* with any Warner & Swasey Heavy Duty Machine. You can give the job everything that carbide tooling can take.

And along with power, these machines have an industry-wide reputation for *holding* their precision accuracy. Warner & Swasey's are built to provide the right combination of power, speed and accuracy for the most rugged, heavy duty service throughout many years of trouble-free service.

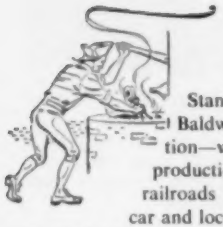
WARNER & SWASEY
Cleveland

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

contouring time cut 58½%

with LeBlond Hydra-Trace

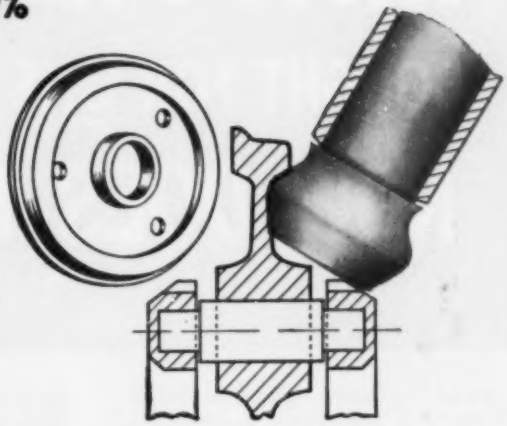
wheel mill roll life boosted 50%



Standard Steel Works Division of Baldwin-Lima-Hamilton Corporation—whose forges first flamed into production in 1795—supplies America's railroads with one-piece, wrought steel car and locomotive wheels. And Standard Steel officials credit LeBlond Hydra-Trace for contributing to their outstanding success in producing these wheels at competitive cost in the quantities needed.

At Standard's Burnham, Pennsylvania Works, rolls of alloy steel are turned to contour and then put to work shaping wheels. The intense pressure and heat of this hot-rolling operation soon work-hardens and wears the rolls out of contour. Formerly a skilled operator—tediously matching contours with a hand-held template—redressed the rolls manually. Four dressings were considered long service for a roll . . . and the work-hardened surface quickly dulled carbide turning tools.

Now, with Hydra-Trace installed on a 25" LeBlond Heavy Duty Lathe, Standard Steel chalks up big savings under all three headings—man hours, material and tool life. As Marty Gotwalt of Swind Machinery—LeBlond's Philadelphia distributor—puts it, "Hydra-Trace automatically keeps the tool just under the work-hardened skin. We've lopped 14 hours off what used to be a 24 hour job."



And that's not all. Minimum metal-removal by the Hydra-Trace method frequently saves Standard's wheel mill rolls for six dressings—*a bonus of two over the manual method.*

Whether your turning problems—like the wheel mill rolls at Standard Steel—center in the toolroom or demand stepped-up output on the production line, Hydra-Trace is ready to help. For all LeBlond Heavy Duty Lathes built since 1935, this template-controlled, hydraulically powered tracer can be mounted in minutes. Templates are flat, compact, and suitable for both rough and finish turning. Call your LeBlond distributor or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

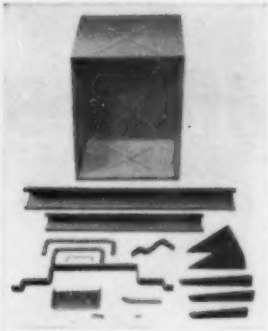
Ask for Bulletin HT2A for complete details on LeBlond Hydra-Trace

turned faster by

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

KRW PRESS
BOUGHT FOR ONE JOB
NOW DOES 15!

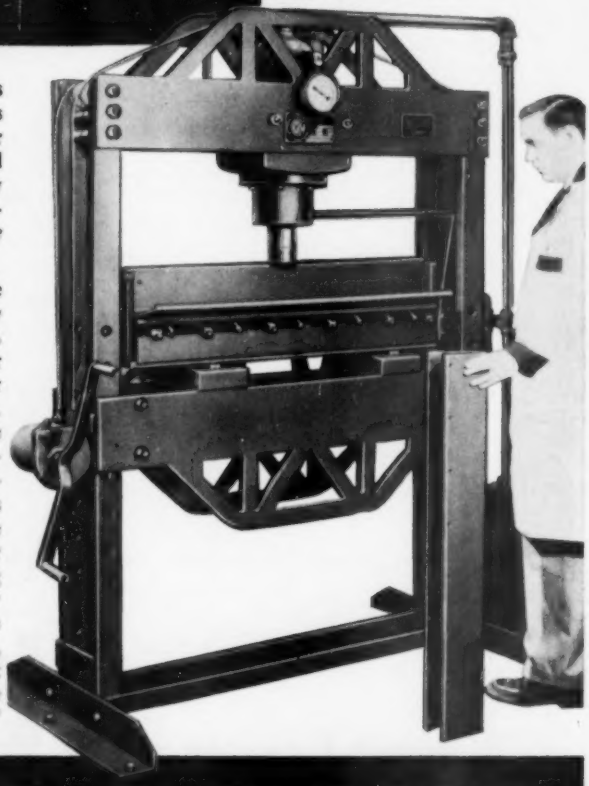


Here's the line-up . . .

Gross Machinery Inc. of Buffalo, N. Y., makers of dry cleaning equipment, forms all these parts on their KRW Hydraulic press. Each one used to be a slow, inaccurate hand or power brake job.

Gross Machinery originally bought this 75 ton KRW motor driven hydraulic press to form cylinder ribs of 14 gauge steel for their dry cleaning tumblers (second and third from top in photo above). Formerly made by hand, each rib required 12 minutes to form. Now the press does the *same job in 1½ minutes.*

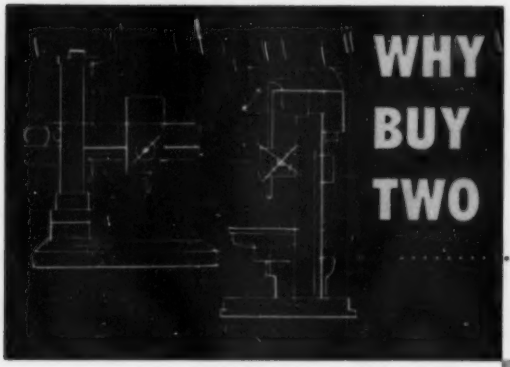
But that was only the beginning. The press soon began poking its nose into every problem in the plant. It gave them a 50% increase in production of filter plates for their tumblers. The lint-collecting drawer (at top in photo above) used to rattle. Gross had almost decided to make these drawers out of heavier gauge, more expensive steel. But then they found that criss-cross ribs formed by their KRW press eliminated the trouble. Brackets for the tumblers, corner inserts for the tumbler hoods, clips for holding wire and tubing on the tumbler — all these jobs are now made faster, more accurately on this versatile KRW press. Earl Westphal, general production superintendent at Gross, says: *"We bought this press late in 1950 and it's paid for itself ten times over."*



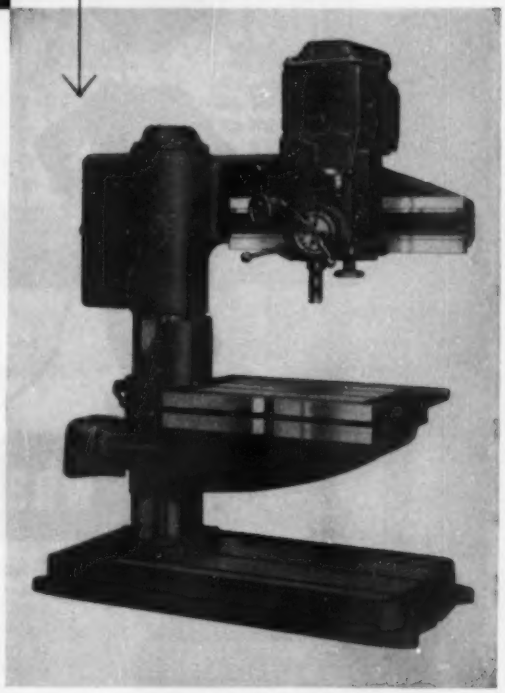
- Bring your pressing problems to K. R. Wilson. We have a full line, 25 to 150 ton capacities, hand operated, air operated or motor driven presses. Write for facts, prices and delivery dates. Dept. 11.

K. R. WILSON

215 MAIN STREET • BUFFALO 3, NEW YORK



WHY BUY TWO WHEN one WILL DO?



Fosdick's Sensitive Radial combines Upright and Sensitive features—rigidity, compactness and convenient table height—with the capacity and flexibility of a Radial. Fosdick has made the table unusually adjustable, leaving the arm at a fixed height. The unique, one-piece column construction makes possible unusual rigidity. Arm clamping is simplified. You get *all* the advantages of *both* the old reliable drills, at roughly the cost of one!

Workpiece sizes accommodated by the Sensitive Radial include the ranges of both Uprights and Radials; setting up on either the adjustable table or the base of the machine. Controls remain clustered at a constant, convenient operator's height.

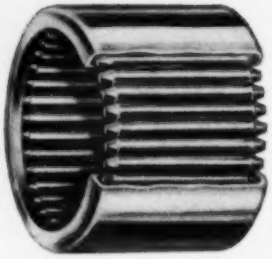
YOUR TOOL DOLLAR buys more capacity in less shop space when you put Fosdick's compact versatility to work on your drilling problems. Only Fosdick builds the Sensitive Radial. Call your distributor or write for Bulletin SRM.

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS
AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

FOSDICK

what's the best buy?



When it comes to selecting an anti-friction bearing, the best buy is the one that best suits your specific application. Many manufacturers have found that for high radial capacity, light weight or compact size, the Torrington Needle Bearing cannot be equalled at any price.

They have found, too, that Needle Bearings provide dollars-and-cents savings in assembly, lubrication and maintenance. All this, plus the initial low cost of Needle Bearings, makes them a really outstanding value.

Next time you specify anti-friction bearings, consider the advantages of Torrington Needle Bearings. Our engineers will gladly give you more details in terms of *your* application.

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers

...heat treatment

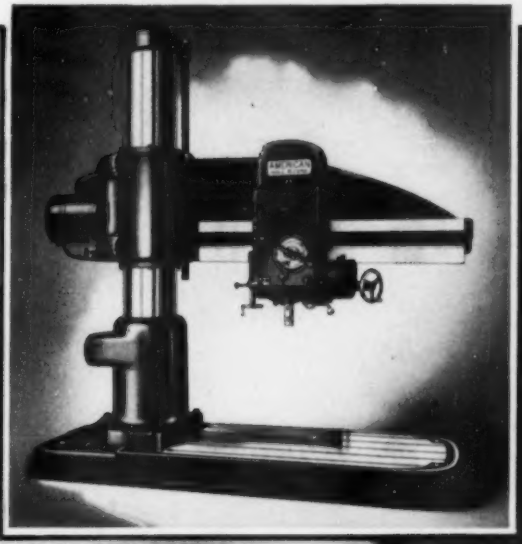
. . . required to produce the ultimate in radial drill spindles

"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

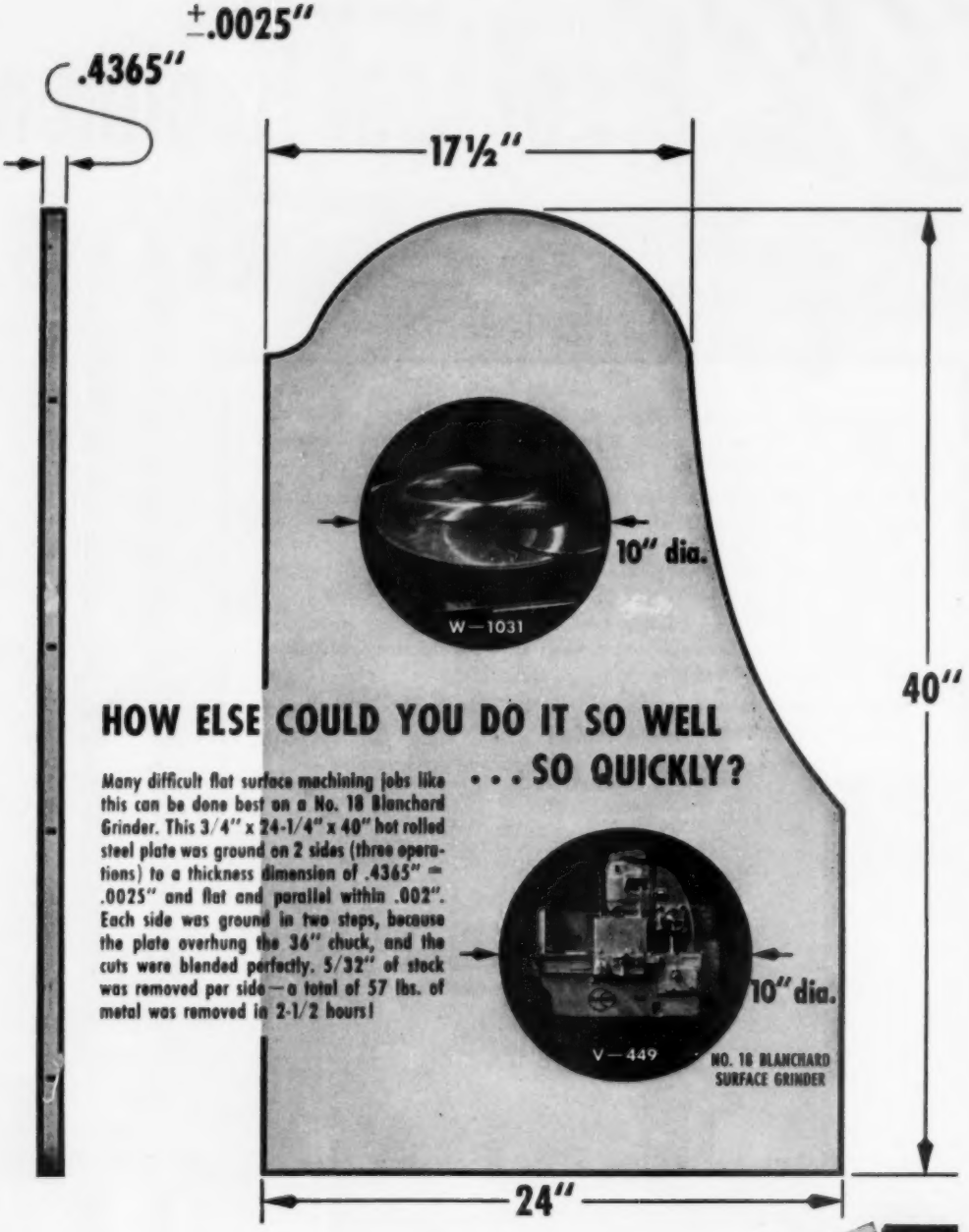
This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial



HOW ELSE COULD YOU DO IT SO WELL . . . SO QUICKLY?

Many difficult flat surface machining jobs like this can be done best on a No. 18 Blanchard Grinder. This 3/4" x 24-1/4" x 40" hot rolled steel plate was ground on 2 sides (three operations) to a thickness dimension of .4365" ± .0025" and flat and parallel within .002". Each side was ground in two steps, because the plate overhung the 36" chuck, and the cuts were blended perfectly. 5/32" of stock was removed per side—a total of 57 lbs. of metal was removed in 2-1/2 hours!

NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

- "Key instrument in inspection"
- "Protects quality prestige"
- "Customers' rejections less than 1/50 of one per cent"
- "Saves from $3 to $5 per hour"

Photo Courtesy of Modern Corp., Detroit, Mich.

Modern Corporation, Detroit, Mich., manufacturer of fine MODCO cutting tools, says this about their new 30-inch J & L Comparator:

"Modern Corporation's new 30-inch J&L Comparator has become the key instrument in the inspection of fine MODCO tools. Its size enables the inspector to examine the complete contour of most tools, without transfer of reference points, and thus without the chance for human error to creep in.

While the primary reason Modern Corporation bought the Comparator was to promote inspection accuracy, it is showing an important cost saving: Every time the J&L Comparator is used, it saves from three to five dollars per hour, depending on the tool under inspection!"

This instrument is one of 14 J & L Comparators in the Modern Corporation plant, and the largest.

P.S.

Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL—*throughout your production lines.* Write for Catalog No. 402. One of our eleven models will fit your needs.

Jones & Lamson Machine Company
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Machine Tool Craftsmen Since 1835

COMPARATOR DIV.
Dept. 710

ALLIS-CHALMERS
COMPLETE
DRIVES

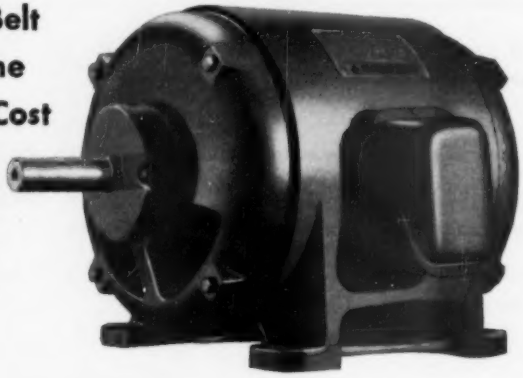
Simplify

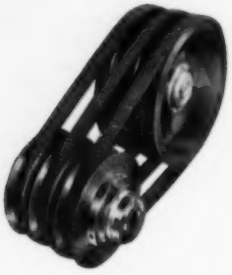
YOUR DRIVE DESIGN PROBLEMS

Allis-Chalmers Matched Motors, Control and V-Belt Drives Save Design Time and Cut Manufacturing Cost

CONTROL

Complete matched control for any motor, including manual and magnetic starters, pushbuttons, and variable speed control.





MOTORS Standard open drip-proof, splash-proof, totally-enclosed, fan-cooled and explosion-proof, ½ hp and up. Also wound rotor and direct current. Special motors to meet your requirements.

Texrope V-BELT DRIVES Fixed speed and *Vari-Pitch* sheaves with stationary or motion control. Famous grommet belt construction. Most complete line of V-belt drive equipment in the industry.

Get the Kind of Help You Need

Allis-Chalmers representatives in every industrial center are at your command. Just call the office nearest you or write Allis-Chalmers, Milwaukee 1, Wisconsin for helpful literature.

Allis-Chalmers Motors and Control	51B6052
Texrope V-Belt Drives	20B6051

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

A-3640

ALLIS-CHALMERS

A-C ALLIS CHALMERS

Do you recognize these famous movie stars?

In New York and other fashion centers, they keep dummies made to the exact measurements of Hollywood stars.

When a star wants a new gown, she calls her shop—and it's measured right on her model!

Then it's only a matter of hours before the gown is in Hollywood. For these style centers ship their fashions the world's fastest way—via Air Express!

Getting new fashions *first* is important to Hollywood stars. But it's even *more* important to fashion buyers in stores all over the country . . . where a few days can mean the difference between profit and loss.

That's why stores (as well as stars) get their fashions Air Express!

Whether your business is fashions or factories, you can profit from regular use of Air Express. Here's why:

IT'S FASTEST—Air Express gets *top priority* of all commercial shipping services—gives the fastest, most complete door-to-door pickup and delivery service in all cities and principal towns at *no extra cost.*

IT'S DEPENDABLE—Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE—Air Express service costs less than you think, gives you many profit-making opportunities.

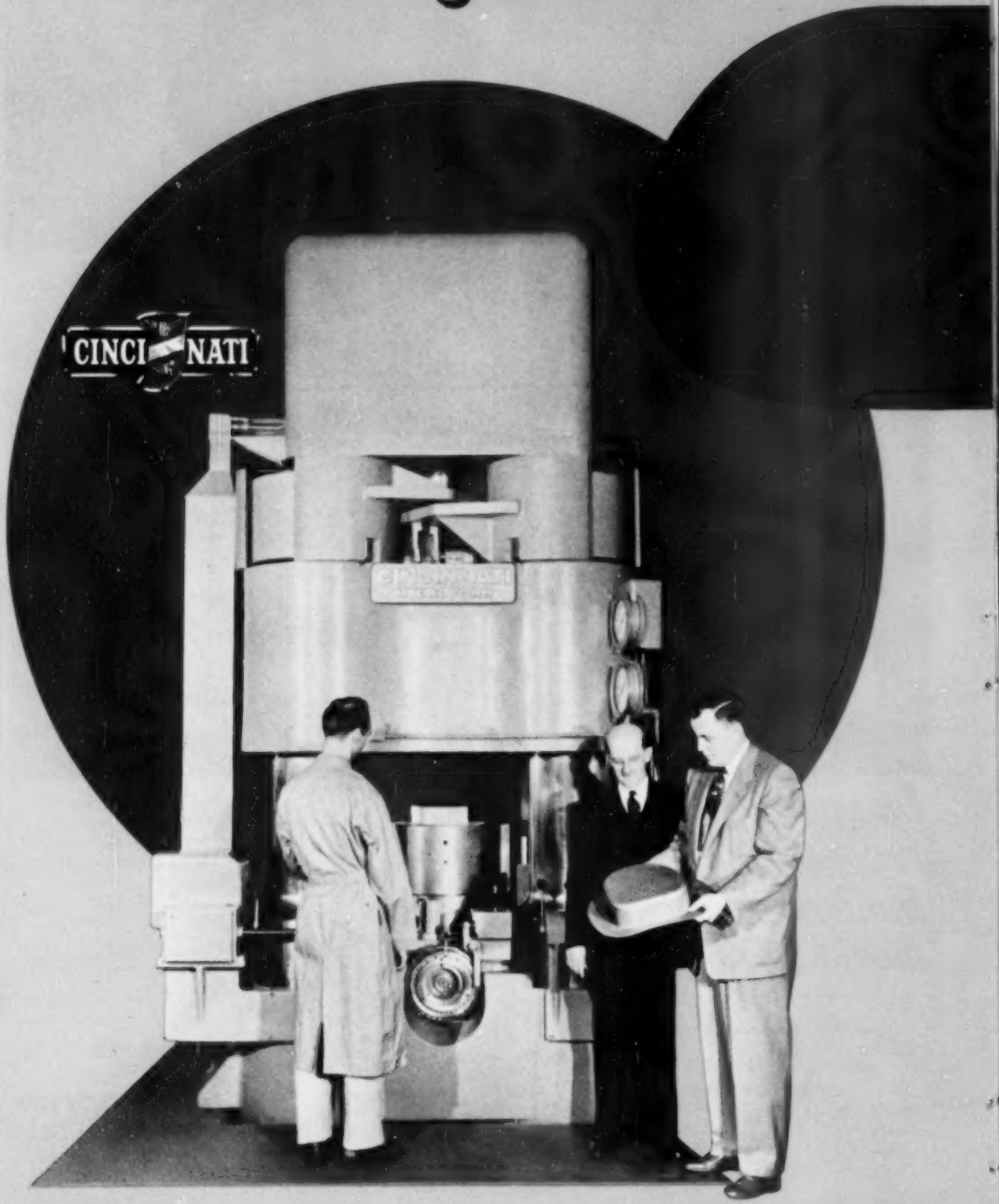
Call your local agent of Air Express Division, Railway Express Agency.

1952—OUR 25TH YEAR.

AIR EXPRESS

GETS THERE FIRST

A revolutionary new metal forming machine tool



NEW CINCINNATI 26" HYDROFORM Built in 12", 19", 23", 26", 32" sizes.

THE NEW CINCINNATI

Hydroform

A product of
THE CINCINNATI MILLING MACHINE CO.

This is an entirely new metal forming machine tool utilizing a new deep drawing principle . . . *Hydroforming.* It will change your thinking on deep drawing and forming!

Practically any shape can be formed from a wide range of materials up to ⅜" thick.

Hydroforming produces deep drawn parts in fewer operations . . . many parts are produced in a single operation.

Only simple, inexpensive tooling is required . . . a draw ring and male punch.

Part quality is improved . . . surface finish is unimpaired.

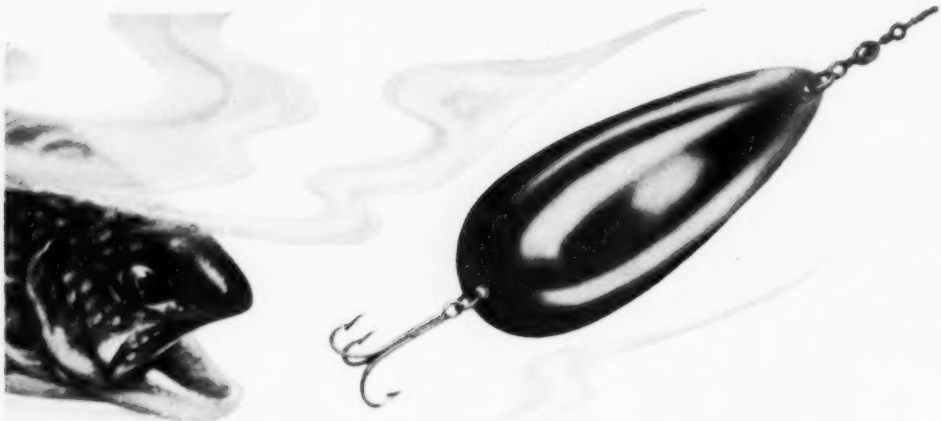
Investigate Hydroforming now!

FULL DETAILS NOW AVAILABLE

New Hydroform Bulletin No. M-1759 is now available. It gives a complete description of the Hydroform process; illustrates a variety of Hydroformed parts, and gives detailed machine specifications. Your free copy will be mailed promptly on request.

Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

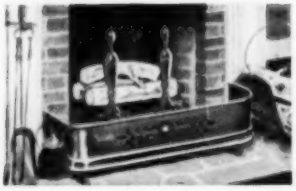


What's the big attraction?

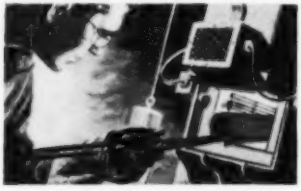
The same brilliance that catches Mr. Trout's eye is also found on a wide range of brass and copper products, from costume jewelry to the gleaming brightwork on a ship.

The clean, bright surface of Chase metals doesn't just happen . . . it is controlled in research laboratories by Chase metallurgists . . . it is checked and tested every step along the way to the finished sheet, rod, wire or tube.

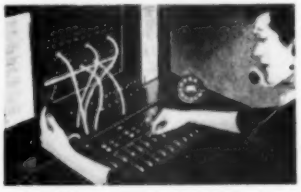
Chase brass and copper products are available, subject to government controls, through dealers, and jobbers across the nation and through Chase's 23 convenient mill warehouses. Chase Brass & Copper Co., Incorporated, Waterbury 20, Conn.



Chase brass and other copper alloys range in color from rich red to bright yellow. The right color for each product and use is one of the features of Chase research and quality control.



When the Chase Technical Advisory Service is asked to solve a problem by a manufacturer, Chase metallurgists will often find the right answer in this research laboratory test furnace.



Patented Chase Telnic® Bronze makes better switchboard parts. Chase research developed Telnic for high strength, excellent machinability, corrosion resistance, and conductivity.

Chase The Nation's Headquarters for BRASS & COPPER

Chase Brass & Copper Co. is a subsidiary of KENNECOTT COPPER CORPORATION

•Albany† Atlanta Baltimore Boston Chicago Cincinnati Cleveland Dallas Denver† Detroit Houston† Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York Philadelphia Pittsburgh Providence Rochester† St. Louis San Francisco Seattle Waterbury *(†Sales Office Only)*

CINCINNATI 9, OHIO

Developed by the world's largest builder of precision grinders to provide you with the better grinding wheels you need, Cincinnati Grinding Wheels incorporate the basic knowledge gained through 25 years of extensive research devoted to the process of chip formation—essentially the same in grinding as in any other type of machining.

Supplementing and verifying this research is the practical experience gained over the years in demonstrating many thousands of new grinding machines under actual production conditions.

In addition, the knowledge and experience behind Cincinnati Grinding Wheels is made available to you through a field organization of trained machinists—men who know grinding machines and cutting fluids as well as grinding wheels.

For a demonstration of how to improve your grinding operations with Cincinnati Grinding Wheels, write, wire or telephone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.

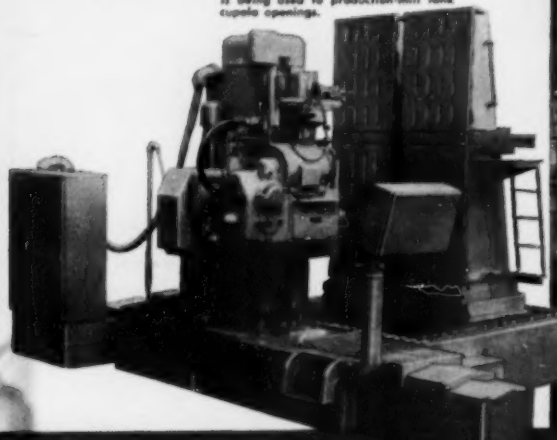
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO., Cincinnati 9, Ohio

CINCINNATI GRINDING WHEELS

TYPE

BG-21

Made with work capacities ranging from 5 feet to 10 feet horizontally and 2½ feet to 4 feet vertically, in single spindle and two-spindle types, this latest model in the KELLER line incorporates all the advanced features of the larger Type BG-22. In this KELLERING operation, profiling control is being used to production-mill tank cupola openings.



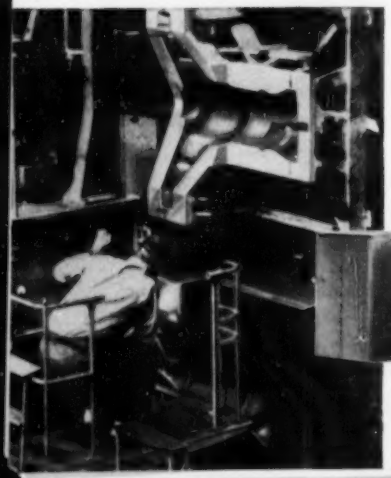
INDUSTRY HAS A WORD FOR IT . . .

KELLERING

TYPE

BG-22

Largest in the KELLER line, the huge BG-22 is made with work capacities ranging from 10 feet to 20 feet horizontally and 5 feet to 7 feet vertically, in single spindle and three-spindle types. Widely used in the automotive industry, it is shown here KELLERING a forging die for a non-ferrous press forging for the aircraft industry.



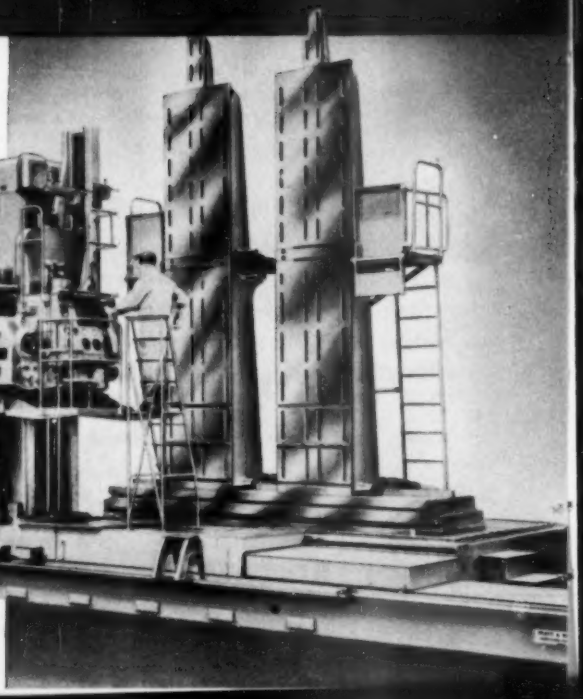
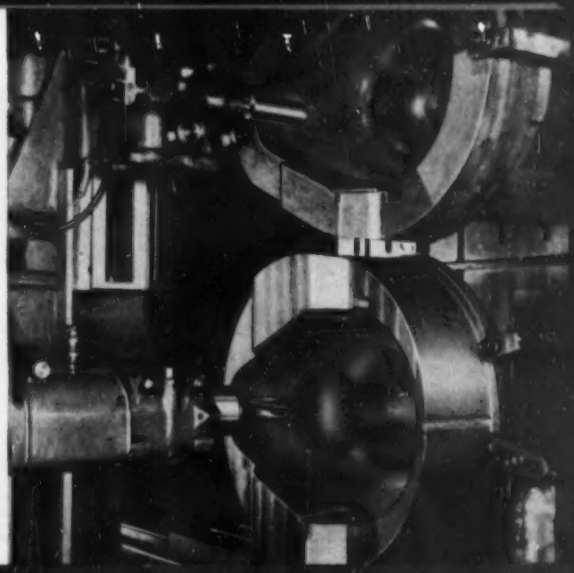


PHOTO COURTESY
WYMAN-GORDON CO.
WORCESTER, MASS.

TYPE

BL

Designed specifically to handle the smaller jobs economically and efficiently, the Type BL is made in two sizes for work areas of 24" x 16" and 36" x 20". A three-spindle machine is also made for the production manufacturing of small parts. The photo at right shows a single spindle machine cutting a precision die casting die in steel from a wood master.



PRATT & WHITNEY

KELLER MACHINES

Automatic Tracer-Controlled Milling

Experience gained during nearly 40 years of designing and building tracer-controlled milling machines combined with Pratt & Whitney's over 90 years of manufacturing precision tools has made the P&W-KELLER Machine the finest of its kind ever produced. It has become so basic and so popular in industry that this type of machining is now universally known as "KELLERING".

Pratt & Whitney-KELLER Machines are powerful, horizontal spindle millers controlled by an electric tracer. They faithfully reproduce the shape of any 2- or 3-dimensional master form or pattern. Very complicated shapes are duplicated as economically as simple work. Designed specifically for tracer-controlled milling, KELLER Machines are unequalled for speed and accuracy, total machining time is much less than that required by any other method, and a minimum of hand finishing is needed. In the production of dies, molds, punches and in many other duplication jobs, you can look to P&W-KELLER Machines for new standards of speed, accuracy, convenience and economy. A complete line, with a wide range of work capacities, makes any job the right size for "KELLERING".

Write on your Company letterhead for fully descriptive KELLER Bulletin No. 490-2 for the smaller work sizes or Bulletin No. 537 for large work.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

No. 537 No. 490-2

First Choice P&W *for Accuracy*

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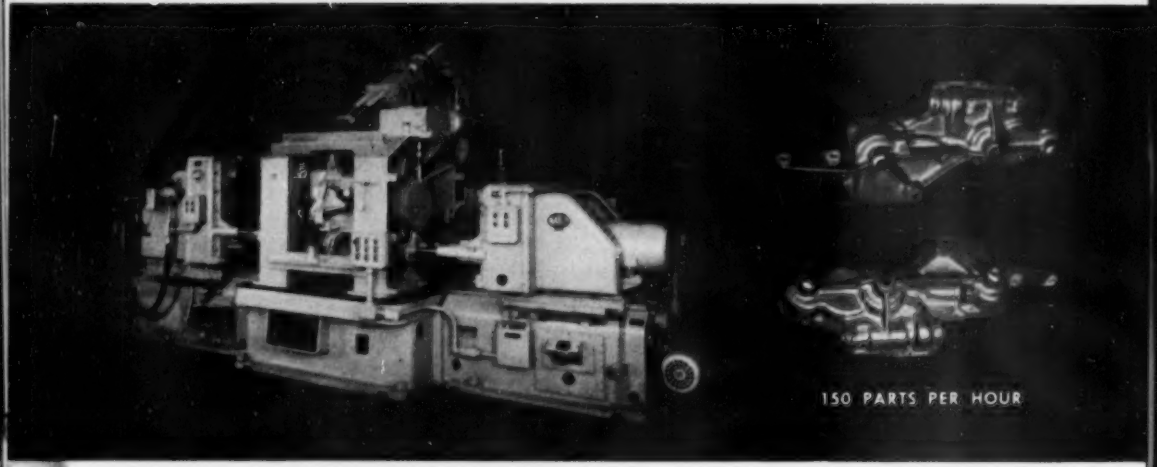
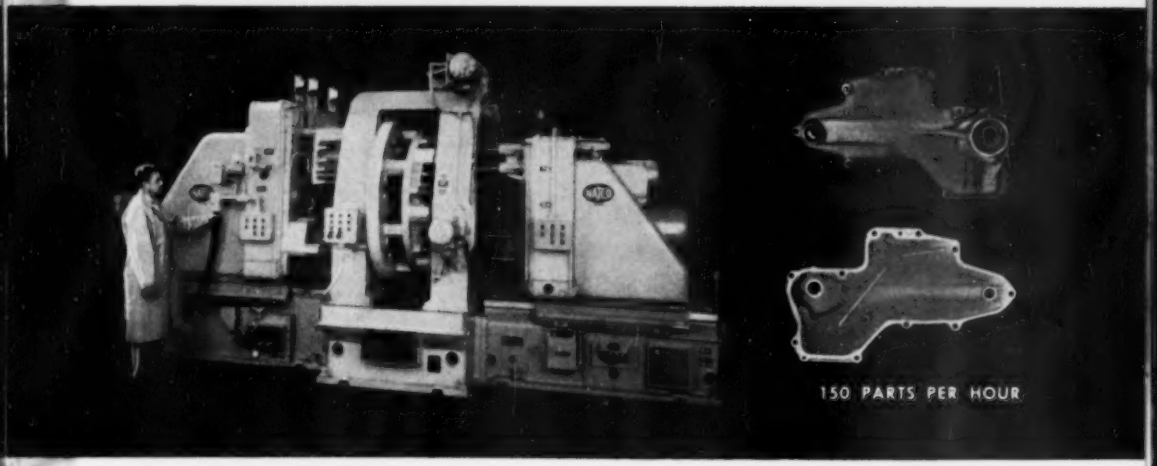
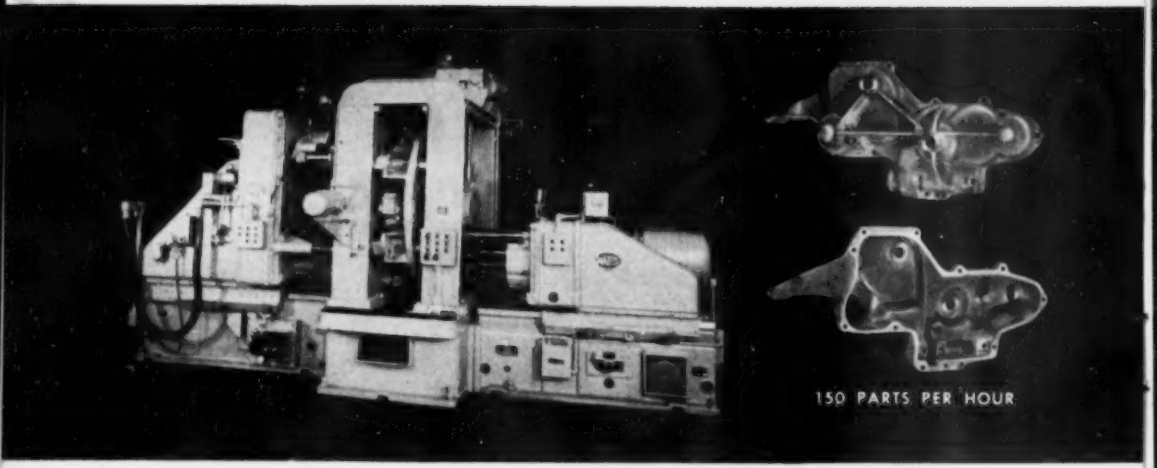
CUTTING TOOLS • GAGES • MACHINE TOOLS



150 PARTS PER HOUR



150 PARTS PER HOUR



150 PARTS PER HOUR

Natco Engineered

FOR QUALITY AND QUANTITY PRODUCTION...

Yes, the three NATCO HOLESTEEL Way Type machines shown here were NATCO engineered and NATCO built to produce high quality automatic washer gear cases.

Operations include drill, chamfer, ream, mill, counterbore, spotface, core drill, plunge cut, hollow mill, face, groove and tap.

BY POPULAR DEMAND the new revised second edition of NATCO "Drills and Drilling Practice" handbook is now available. Send one dollar for this useful and valuable drill guide.

Call a Natco Field Engineer

To help you solve your problems in Drilling, Tapping, Boring & Facing.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices | 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit
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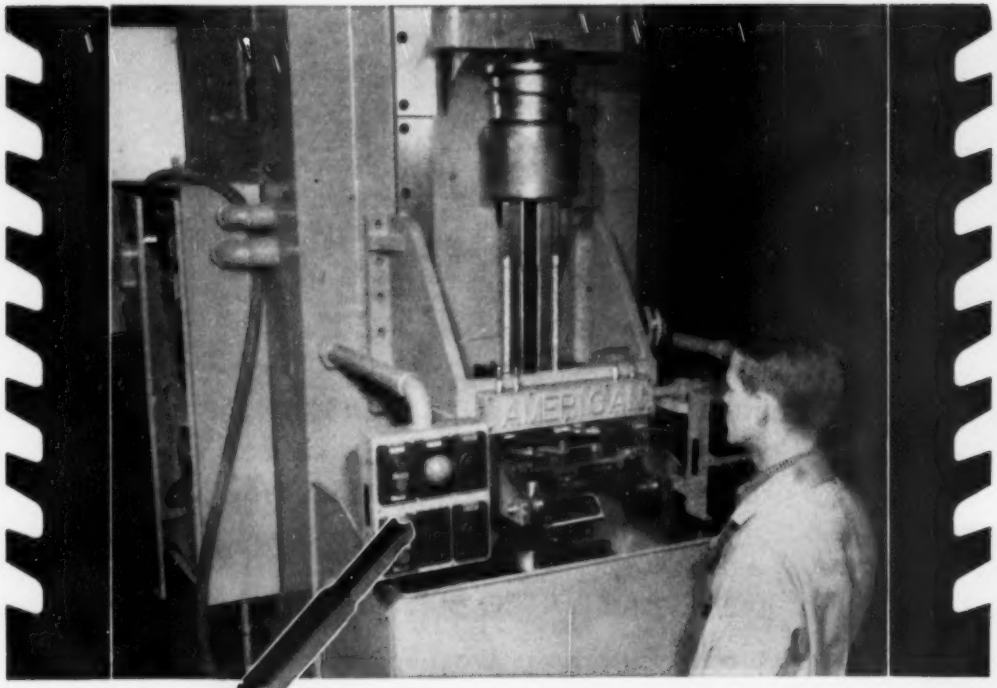


ONE PASS *Broaches* SIX WINDOW OPENINGS

Typical result engineered the *American* way

A special, large, American-engineered, automatic, six station pull head, on a standard American VP 3-10-30 Vertical broaching machine, helps to speed production on this automatic transmission part. A total of twelve angular sides, plus twenty-four corner radii are finish broached on 150 of these steel forged parts per hour. The machine is equipped with an American-engineered fixture with a manually operated work slide interlocked with the machine cycle for maximum safety.

Developing jobs of this type is an everyday occurence at American Broach. Your broaching job benefits from the skill and experience of American engineers . . . engineers who design all three . . . broaches, broaching machines and broaching fixtures. Remember, the best way to do your job within cost and production requirements . . . is the American Way.

Write for our new Blue & Gold catalog containing complete machine specifications. Address Dept. A.

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

SUNDSTRAND

CLEEREMAN DRILLING MACHINES

LOWEST Operating Costs!

Why?

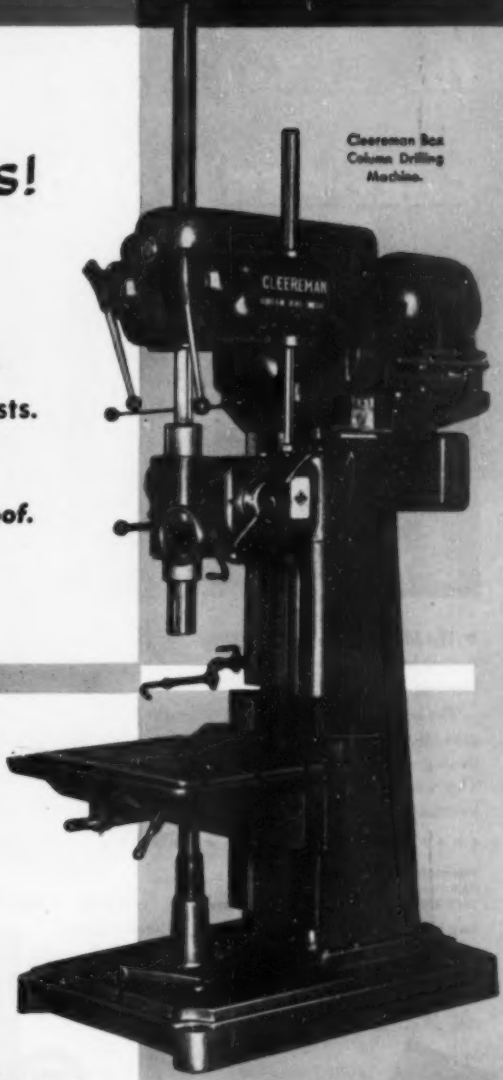
1—Eliminate Down Time.

2—More Power to Produce.

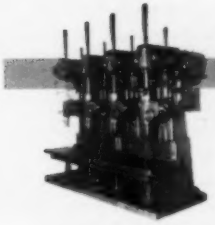
3—Lowest Maintenance Costs.

4—Less Operator Fatigue.

Go to any Cleereman user for proof.



Cleereman Box Column Drilling Machine.



Cleereman Multiple Drilling Machine.

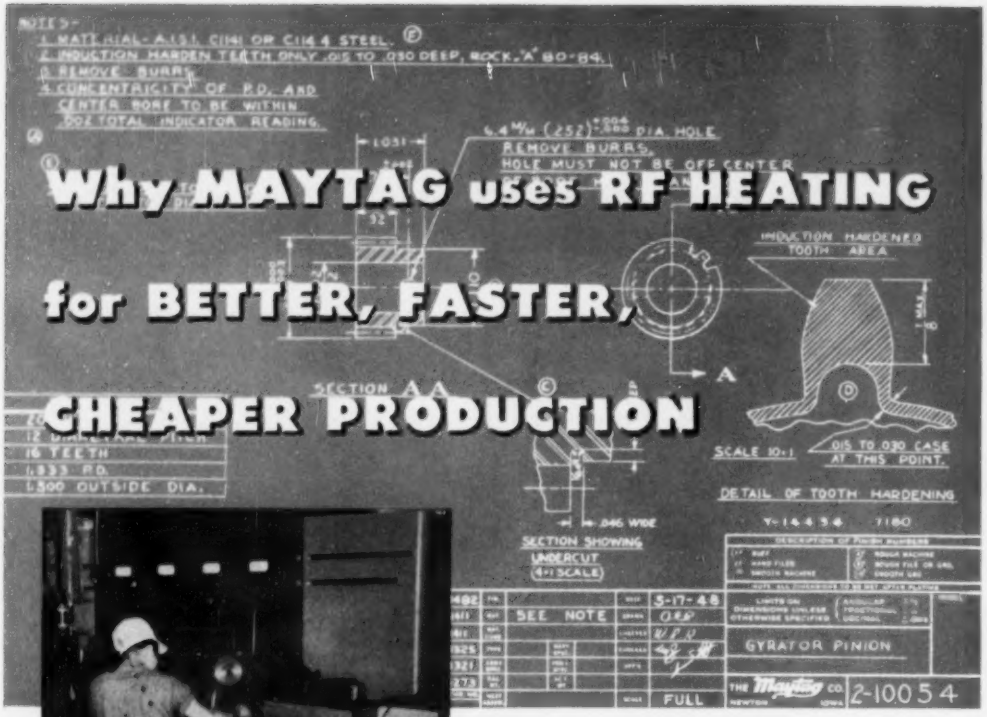
Cleereman Round Column Drilling Machine.

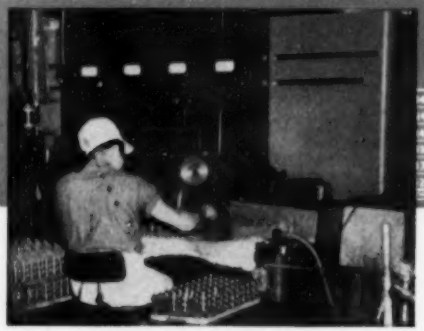
Affiliated with..

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Why MAYTAG uses RF HEATING for BETTER, FASTER, CHEAPER PRODUCTION


NOTES-
1. MATERIAL - A.I.S.I. C1141 OR C1144 STEEL.
2. INDUCTION HARDEN TEETH ONLY .015 TO .030 DEEP, ROCK. 'A' 80-84.
3. REMOVE BURRS.
4. CONCENTRICITY OF P.D. AND CENTER BORE TO BE WITHIN .002 TOTAL INDICATOR READING.
REMOVE BURRS.
HOLE MUST NOT BE OFF CENTER
INDUCTION HARDENED TOOTH AREA
SECTION A-A
SCALE 10:1
.015 TO .030 CASE AT THIS POINT.
DETAIL OF TOOTH HARDENING
16 TEETH
1.333 P.D.
1.500 OUTSIDE DIA.
.046 WIDE
SECTION SHOWING UNDERCUT (4:1 SCALE)
SEE NOTE
5-17-48
GYRATOR PINION
FULL
THE Maytag CO. NEWTON IOWA
2-100 54



● The Maytag Company has found, for fast production at low cost and high quality, Westinghouse RF Heating installations are the answer.

The installation of a process using two 20 KW-450 generators—for both spline and straight shaft hardening—has paid for itself in *less than 3 months!* This was shortly after World War II, and since then continued use has piled up real profit in savings.

In building a new plant for production of a completely new line of automatic washing machines, Maytag turned to induction heating for brazing and hardening . . . and they specified Westinghouse. A 50 KW and 10 KW RF generator, with associated work handling equipment, are now accounting for still further savings and continued high quality. That's why Maytag says that not only is the Westinghouse RF process the best method for heat treating production parts, but, also, "it produces precision work at the price of rough and ready work."

As we helped Maytag, let us help you solve your problems of increased production at low cost and with high quality. By all means, investigate the possibilities of installing Westinghouse RF Heating.

Westinghouse Electric Corporation
Department M-41
2519 Wilkens Avenue · Baltimore 3, Maryland

Send me your informative case history booklet on induction heating.

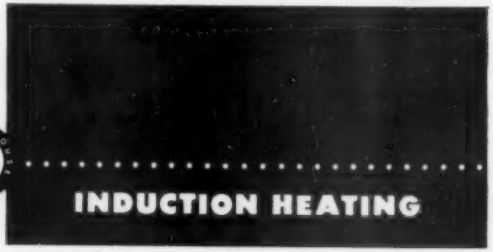
Name .....

Company .....

Street .....

City ..... Zone ..... State .....

J-82241



This Year

you benefit *more than ever*

from your American Machinist subscription

This is *American Machinist's* 75th year of service to metalworking men like you. We want it to be a notable year for the breadth and quality of the informative help we bring you. To make it outstandingly so, we are adding to the abundant facts and production data you receive in our regular issues, every other week, an exceptional *75th Anniversary Issue*, to be published in October. The exciting facts about *what this issue means to you* are on the inside pages of this report.

the better the products you want to produce

the faster and more efficiently you want to manufacture them

the surer you want to be in your selection
of materials and components for them

the smarter you want to be about your
products' present and future markets . . .

THE MORE YOU WILL FIND
THIS WHAT'S AHEAD
THE NEXT 10 YEARS ISSUE
AN ESSENTIAL, EVERY-DAY GUIDE
TO THE ANSWERS YOU MUST FIND
AND THE DECISIONS
YOU MUST MAKE

This Year

you benefit *more than ever*

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NEXT 10 YEARS

YOU ASK THE QUEST

and let the WHAT'S AHEAD

want an overall picture of your industry... past and present?

Such a picture can be very helpful to you . . . and not a bit less so because it is also highly interesting and stimulating reading. Our editors will bring you such a picture in the WHAT'S AHEAD issue . . . with all the breadth and abundant facts which only McGraw-Hill's great resources and *American Machinist's* 75 years of intimate association with Metalworking make possible.

What lies ahead for you and your industry is often clearly understood and evaluated only when you know what *has* happened and *is* happening now. So the WHAT'S AHEAD issue will bring you a carefully compiled summary of the most important developments in Metalworking's past 75 years . . . and a report on what they have meant to Metalworking's progress and growth.

Included will be the *American Machinist* Index of Metalworking Production . . . carefully compiled for this issue *all the way back to 1877*. This will be the first time such an invaluable picture of 75 years' production records in your industry has ever been made available.

And because the future developments you can expect in specific production methods and equipment owe much to past and present ones, each individual section of the WHAT'S AHEAD issue will include the most significant facts about past and present methods and equipment, as well as the tremendously important developments our editors see ahead for the next 10 years.

want to know how much . . . and why . . . metalworking will grow in the next 10 years?

Obviously, you *must* know, if you and your company are going to keep abreast of your industry's progress. And one of the most important values the WHAT'S AHEAD issue will give you is an exclusive forecast of Metalworking's probable growth in the decade ahead. It is based on months of careful study and research by both our editors and the McGraw-Hill Department of Economics.

This irreplaceable, basic guide to your future manufacturing and market planning will analyze for you the strong influence which will be exerted on *your own* future by such basic factors as population growth . . . industrial employment . . . consumer income and expenditures . . . productivity . . . increased mechanization . . . expected expansion in the industries to which you sell . . . and many more.

This is information essential to your company's broad planning for tomorrow. It is information you will find almost constant use for in the important months and years ahead.

there's a lot ahead . . . for

TIONS . . .

issue give you hundreds of brilliant answers

want to make some sound, long-range plans for machinery and equipment replacement?

You can make them . . . accurately and far-sightedly . . . with the abundant information this WHAT'S AHEAD issue will bring you in every important field related to metalworking production. It's the kind of detailed, sensible information you *must have* to plan a long-range machinery and equipment improvement program.

The machine tools, materials handling systems, heat treating processes, assembly equipment, inspection setups, or other machinery and processes you install next year, or the year after, must be equipped to give you efficient, profit-building service for years to come. You want to buy the best . . . and no matter what equipment you plan to buy, the WHAT'S AHEAD issue will guide you to the *best for you* . . . and show you how to spot the features that the outstanding machinery and equipment of tomorrow will feature.

Your key to staying ahead of your competitors . . . and capturing your share of tomorrow's bigger markets . . . is increased production efficiency. No matter how much money you plan to invest in new shop equipment, the WHAT'S AHEAD issue will help you to invest it more soundly.

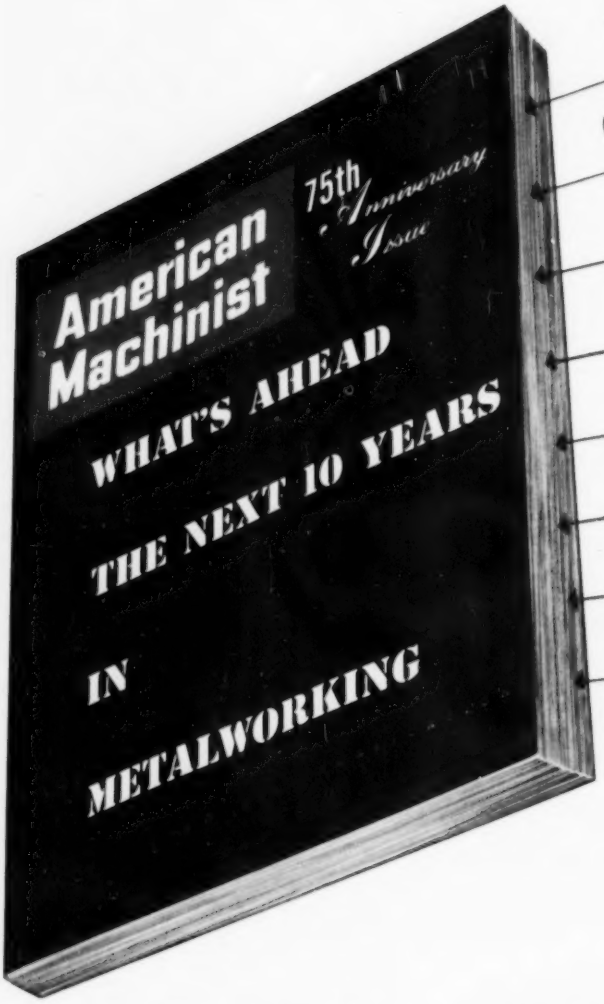
need the best thinking and experience on a specific production problem?

If you do, *you'll find* real help in the WHAT'S AHEAD issue. You may well have a problem now that needs immediate solution . . . and because today's best practices are thoroughly explored in every section of the WHAT'S AHEAD issue, its pages will be as valuable to you in finding answers to your present problems as in helping you plan efficiently for tomorrow.

To the far left of this page is a condensed listing of the broad subject classifications you will find in the WHAT'S AHEAD issue. They open the door to more information about your industry and its best production methods and equipment than you have ever had before in one place. To bring this information to you represents thousands of editorial hours, contributed by the most experienced staff that edits any metalworking publication.

You will want to make the most of the help, inspiration, and data the WHAT'S AHEAD issue of *American Machinist* will bring you. When this issue reaches you in October, *be sure to take good care of your copy.* It comes to you as part of your regular subscription to *American Machinist*, without extra charge, but high production costs and wide demand will make replacement copies difficult to secure. . . . **When the WHAT'S AHEAD THE NEXT 10 YEARS issue reaches you, *read* it . . . *keep* it . . . *use* it . . . because:**

r you and your industry . . . in the next 10 years . . .



materials and components

casting and molding

tools and tooling

presswork and forging

machining

joining and assembly

heat treating and finishing

inspection and testing

plant services

Here . . . in one place . . . for continuing study and reference . . . sectionalized by major subjects and indexed in detail: the most important facts about what's ahead for your industry . . . the machinery, equipment, production processes, materials, components, and plant services available . . . all made more useful against a background of metalworking history and economics . . . today's best production methods . . . a forecast of tomorrow's . . . plus a careful analysis of the features metalworking production leaders want in new machinery and equipment . . . and what leading suppliers plan to provide in the next decade.

Invest in better methods for guaranteed returns

Automatic Bar and Chucking Machines • Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
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NEW BRITAIN
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THE NEW BRITAIN GRIDLEY MACHINE DIVISION
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All-new G-E Fhp Motor Has

What *does* industry want in a motor? Smaller size? Lighter weight? More versatility? Functional design? They're all here . . . in the new Form G motor! Yes, and *full NEMA performance, too!*

Smaller size makes product improvement possible despite critical material shortages. Lighter weight cuts shipping, installation costs, means easier handling.

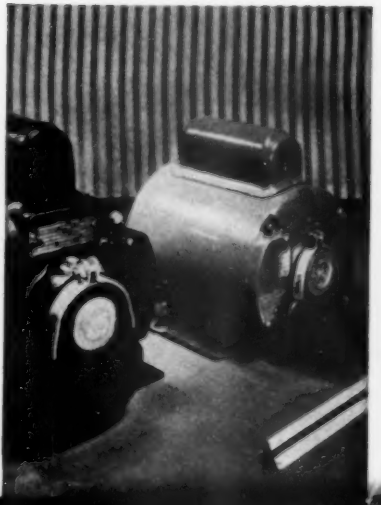
Versatile, all-angle sleeve-bearings mean a general-purpose motor can replace more costly specials.

Clean-cut, functional design packs maximum power in minimum space. There's room on your product for motor improvement. Ask your G-E Sales Engineer to explain the details of the most sweeping advance in motor history . . . the new Form G fractional!

Write for bulletin GEA-5567 for a full description. *Section 700-120, General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

SMALLER . . .



ALL NEW! Shaft to shell, new motor completely redesigned, functional, no waste space.

TOUGH! New nylon insulation, braidless neoprene leads withstand insulation hazards.

QUIET! Magnetic noise cut by permanently fixed stator punchings, and new rotor design.

LONG LASTING! Switch, terminal board in shell, not in end-shield: prevents lead-damage.

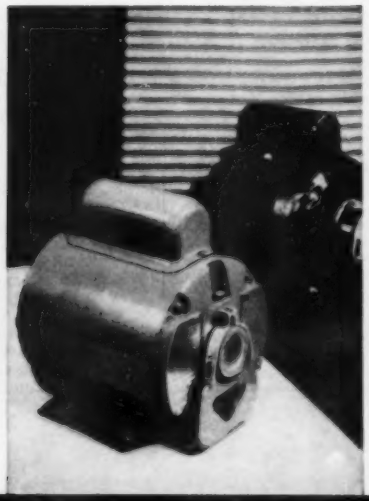
EASY TO USE! Terminal box cover plate shows connections inside, lubrication outside.

FLEXIBLE! Operates shaft up, down, any position. Cradle base allows rotation of motor.

Everything Industry Wants!

LIGHTER . .

BETTER LOOKING . . .



MORE VERSATILE!

Are you getting maximum returns from your carbide-tool investment?

You are if your cemented carbide tools pay off with top production at top tool speeds . . .

if top tool life is combined with top adherence to tolerances . . .

if top production per tool is coupled with minimum rejects . . .

and if your investment in carbide tools is limited to universal-use standards, permitting a low inventory of special multiple-point tools.

In short, you are getting maximum returns if you use Carboloy Cemented Carbide tools, for Carboloy quality and service are designed to deliver all carbide benefits, to give you maximum returns from each dollar invested in cemented carbide tools.

Scan the Carboloy products briefly described on these pages. Then shoot the coupon at the right back to us for your free copy of the complete Carboloy General Tool Catalog.

And for your immediate carbide-tool needs, why not telephone your Carboloy Distributor right away?

Stocks now at your Carboloy Distributor's — ready for immediate delivery — will satisfy your every need in Standard Carboloy Tools and Blanks, and most special tools equipped with Carboloy Cemented Carbides. Call your local Carboloy Distributor now.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

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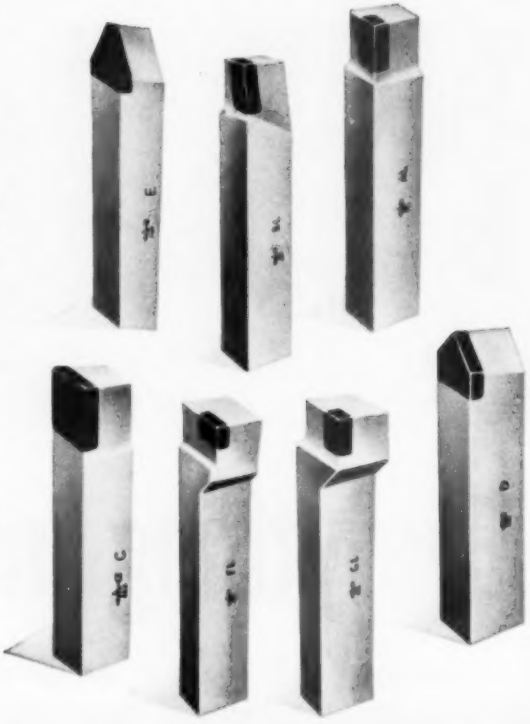
DETROIT, MICHIGAN; EDMORE, MICHIGAN;
AND SCHENECTADY, NEW YORK

Magnetic ideas for the shop!

Carboloy Permanent-Magnet Sheet-Steel Separators prevent feeding of doubles. Use permanent magnets to give an extra "hand" in your shop work. Great for magnetic stands, tool-holding devices, sweepers' "pick-up" tools, magnetic paper grippers on machines, containers for small parts, and magnetic retrievers. Write for FREE Carboloy Permanent Magnet Stock Catalog, PM-100. (Use handy coupon at right.)

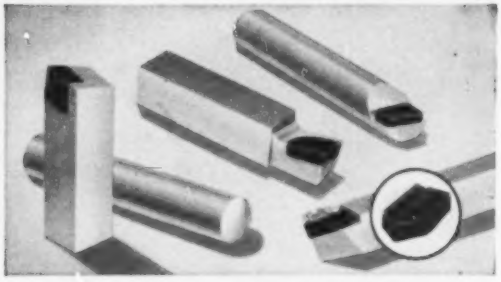


11 STANDARD CARBOLOY TOOLS

Perform 80% of Your Machining!

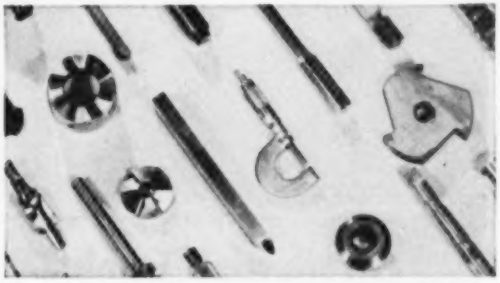
Chop your costly special carbide-tool inventories with Standard Carboloy Tools. Only 11 styles (right-hand tools not illustrated) do up to 80% of all your single-point tool machining. Whatever the job, odds are versatile Standard Carboloy Tools will do it. What's more, they'll outproduce and outlast high-speed steel tools by as much as 10 to 1! At the same time, they'll pile up savings in machine-tool maintenance, downtime and replacement. You can count on Standard Carboloy Tools, whether used "as is" or quickly and economically specially ground in your own toolroom, to do a wide variety of jobs faster, better, for less. (See pages 14-19, 20-27 in your Carboloy General Tool Catalog, GT-250.)

STANDARD CARBOLOY BLANKS are mass-produced, available in many styles and hundreds of sizes at extremely low prices. They are designed for broad use in most of your machining needs. Brazing Carboloy Blanks to tool shanks will handle your emergency jobs readily; no time lost on special tooling. (See pages 20-22, 32-42 of your Carboloy General Tool Catalog, GT-250.)

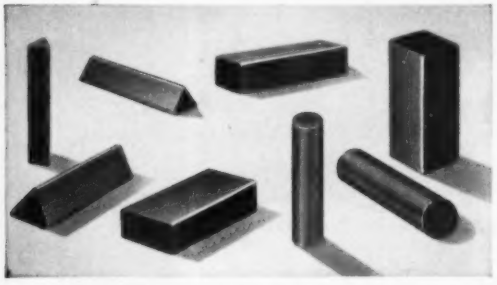


OTHER CARBOLOY STANDARD TOOLS in a wide selection that includes: roller turner tools, blanks for clamped-on-type tools, boring tools, and solid Carboloy cylinders that can be adapted to many special shapes in solid boring tools. All items are in stock; semi-finish, or finish-ground, ready for use. Tools that will save plenty in production. (See pages 22-28 of your Carboloy General Tool Catalog.)

SPECIAL CARBOLOY BLANKS can be furnished in any size, shape and grade of cemented carbide to meet your exact, individual requirements. In addition to general types of special shapes, flat-formed blanks with complicated shapes and a large selection of semistandard and modified blanks can be made, ground or unground. (See pages 43-44 of your Carboloy General Tool Catalog, GT-250.)



SPECIAL TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE. Carboloy Cemented Carbide is furnished to more than 250 leading tool manufacturers for use in special tools, many of which are stocked by Carboloy Distributors. Also, when requested, Carboloy engineers work with the tool maker to help his customer (*you*) solve special problems. (See pages 28-29 of Catalog, GT-250.)



CARBOLOY INSERT BLANKS are available in stock in round, triangular, square and rectangular styles in a wide variety of sizes; they are finish-ground, ready for use in your mechanical-type holders. Inserts are quickly resharpened by off-hand grinding and have several cutting edges, depending upon shape of insert. For example, ½" square insert has eight cutting edges, four on either side. (See pages 20-22 of your Carboloy General Tool Catalog, GT-250.)

Complete Carboloy Tool Catalog FREE!

It's a fact-packed 60 pages. Hundreds of illustrations showing typical uses, specifications. Also, conversion tables for cutting steels, ferrous, nonferrous and nonmetallic materials. Lists other *free* Carboloy Services, technical literature. *Send coupon below today!*

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DEPARTMENT OF GENERAL ELECTRIC COMPANY
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Date _____

Please send me, without cost or obligation:
☐ Carboloy General Tool Catalog, GT-250
☐ Carboloy Permanent Magnet Catalog, PM-100

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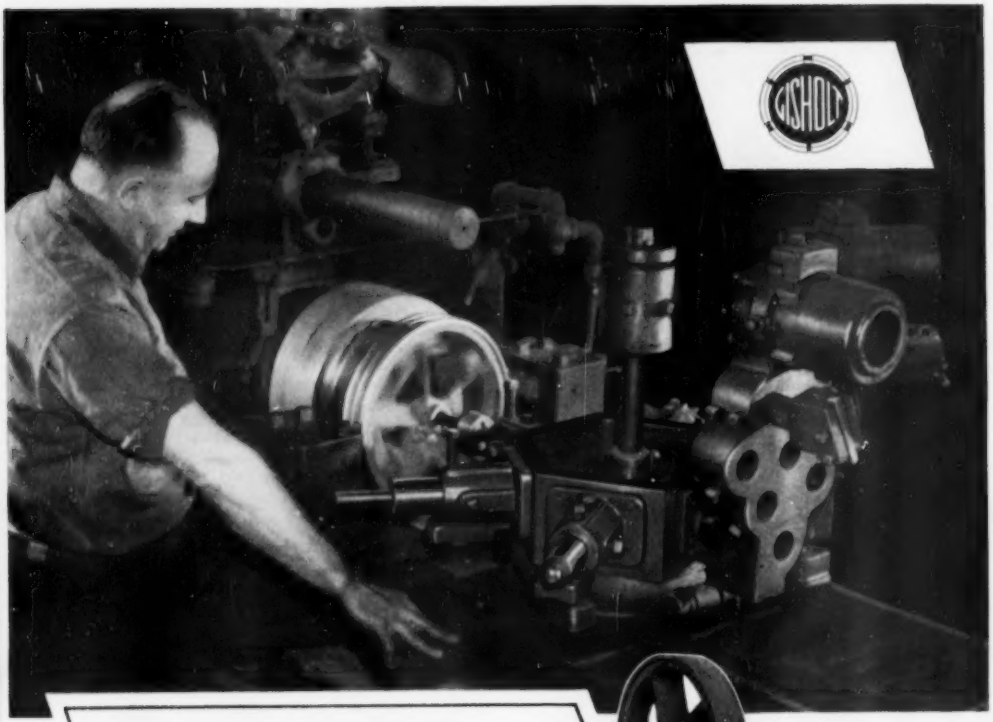


Production Trebled by the *FASTERMATIC!*

Rough Casting

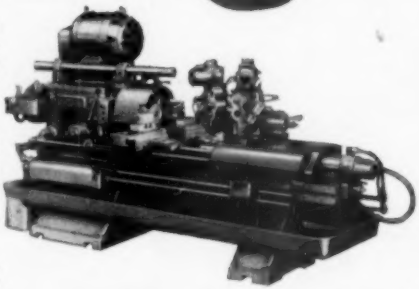
Finished Sheave

Note here the rather simple tooling arrangement for machining cast iron sheaves. This setup, similar to regular turret lathe work, is made just as easily. But here, the machine performs 15 different operations—holds tolerances consistently—completes the entire machining job in 13 minutes. The former time was 39 minutes.

Completely Automatic Cycle

It's the swift, automatic cycle of the Fastermatic that accounts for such substantial time savings. With its hydraulic feed system and automatic speed control, the operator has only to load the chuck, start the machine and remove the finished work. Usually, the operator has time to tend a second machine.

Now, when you need still greater production, it is a good time to look into the Fastermatics. Write for the Fastermatic catalog.



THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

The Fastermatics are universal automatic turret lathes. Designed for accurate, high production turning, they can also be economically used on comparatively small lot work.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

HARDINGE
ELMIRA, N.Y.

Style "S"
Master Collets

The only Master where there is no work pressure on the screw.

and Low Cost Pads

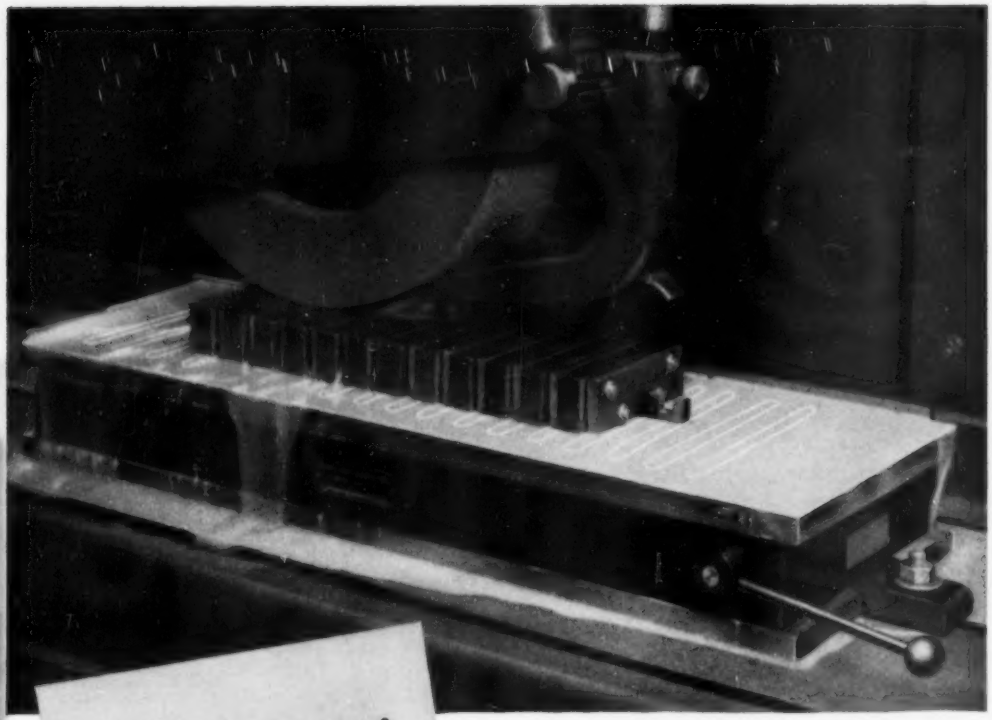
FOR QUALITY PERFORMANCE

Only HARDINGE Master Collets and Pads have this independent double dovetail clamp which anchors the pad in place . . . . . no threaded holes in Master Collets or Pads.

Write for Bulletin "S"

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



Economical way to save machinists' time

PERMANENT MAGNET CHUCKS

by Brown & Sharpe make the most of a skilled machinist's time — let him do, speedily, many tasks that require extra work by other means.

These economical time-savers are completely portable, have no wires to connect, cost nothing to operate, hold as long as desired without heating, last indefinitely. Permanent Magnet Chucks speed setting up . . . eliminate the need for clamps, vises, jigs or fixtures on many jobs. A quick shift of a lever engages or disengages magnetic holding power.

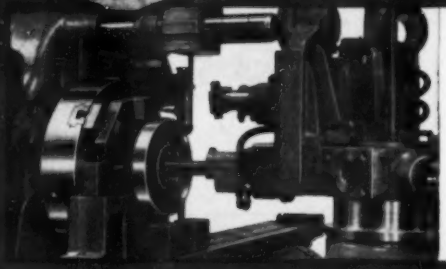
Complete line includes Rectangular Models for grinding, inspecting, light machining; and Rotary Models for light lathe work, cylindrical and face grinding. Rectangular Models available in 8 sizes from $2\frac{7}{16}$" x $5\frac{1}{4}$" to $12\frac{1}{8}$" x 36"; Rotary Models in 5", 7", and 9" diameters. For sale only in the United States and its territories. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

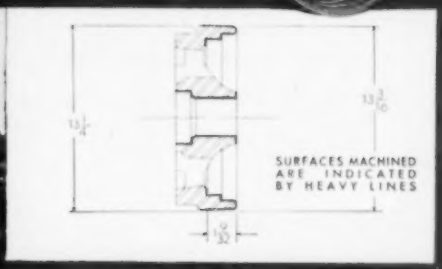
WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

Between this..... and this

13 SURFACES MACHINED, INCLUDING SINGLE-POINT TAPER TURNING OF O. D.

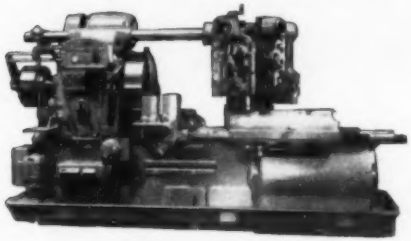




THE POTTER & JOHNSTON 6-DREL

Automatic Turret Lathe

DID THE JOB RAPIDLY, ACCURATELY, PROFITABLY



It takes full power, real productive capacity and efficient tooling to machine precision parts like this *steel coil support* with speed and economy. That's why a Potter & Johnston 6-DREL Automatic Turret Lathe was selected. In the ingenious tooling set-up engineered by P & J Specialists, the overhead pilot bar is equipped with a cam which operates a turret slide tool to machine the O.D. taper with a single-point cut.

For increased output with high accuracy and lowest unit cost, today's top production team is P & J Automatics and P & J Tooling. If you're looking for more and better work with fewer rejects, you'll want to get the facts on Potter & Johnston Automatics. Write on your company letterhead for your copy of Bulletin No. 148. And be sure to send your tough production problems to the P & J Engineering Department. We will be glad to recommend the best possible combination of tooling and operation sequence. There is, of course, no obligation.

Precision Production Tooling for over 50 years

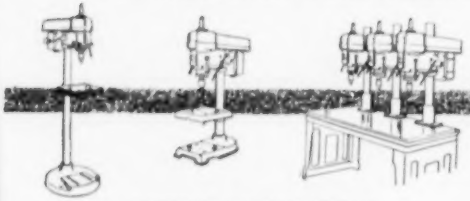
POTTER & JOHNSTON COMPANY

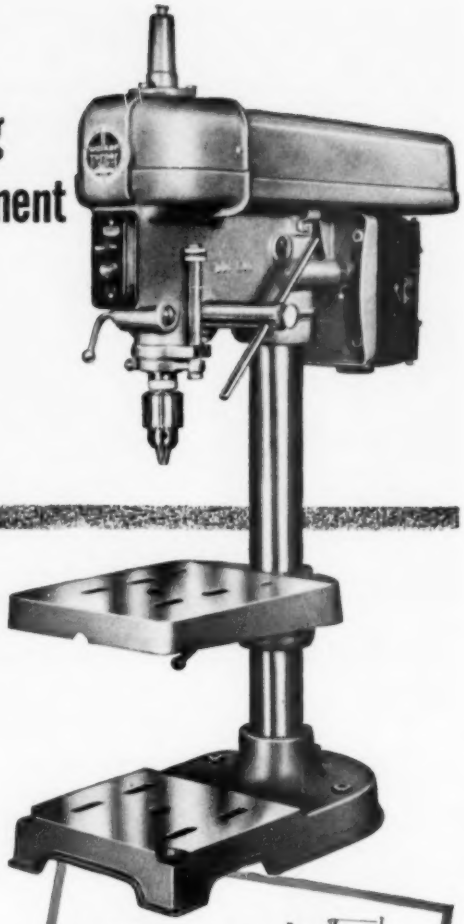
PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF PRATT & WHITNEY P&J DIVISION NILES - BEMENT - POND CO.

For fast, accurate drilling at new low levels of investment and production costs

NEW WALKER-TURNER 15" Production DRILL PRESSES





GENERAL SPECIFICATIONS

SPINDLE TRAVEL: 4½" or 6".

FOUR SPEEDS: 600, 1250, 2440 and 5000 R.P.M. with 1740 R.P.M. motor.

CAPACITY: Bench Models—12" chuck to table, 17½" chuck to base. Floor Models—39⅛" chuck to table, 46" chuck to base. All models 7½" center of chuck to column.

CHUCK: #6A Jacobs key type capacity 0 to ½".

TABLE: 10" x 12¼" machined working area.

BASE: 10" x 9" machined working area on Bench Models. 11" x 9" on Floor Models.

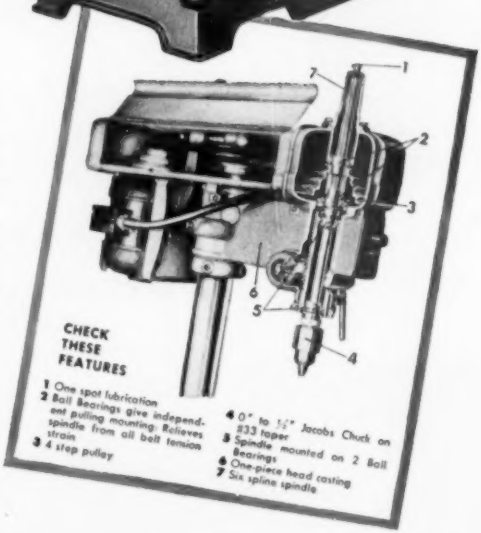
SPINDLE: Six spline full floating type, ⅝" diameter, male #33 Jacobs taper for No. 6A Jacobs Chuck, or #1 Morse taper socket (optional).

PULLEY: Straddle mounted on two ball bearings for extra rigidity. New upper mounting permits quick belt changing.

COLUMN: Ground seamless steel tubing, 2¼" in diameter.

The specifications give you some idea of the capacity, wide range of speeds, and up-to-the-minute engineering of the new Walker-Turner 15" Production Drills. When you see these machines in operation . . . note how readily they can be mounted in-line, for simultaneous drilling operations, you'll have a better idea of their accuracy and flexibility.

But it's only when these drill presses have been installed in your plant that you can appreciate how Walker-Turner design cuts drilling costs and increases productive efficiency. 72 different models, to meet practically every drilling requirement. Drill heads adaptable to hundreds of diversified uses.


CHECK THESE FEATURES
1 One spot lubrication
2 Ball Bearings give independent pulling mounting. Relieves spindle from all belt tension strain.
3 4 step pulley
4 0" to ½" Jacobs Chuck on #33 taper
5 Spindle mounted on 2 Ball Bearings
6 One-piece head casting
7 Six spline spindle

SOLD ONLY THROUGH AUTHORIZED DISTRIBUTORS

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walker-turner DIVISION
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

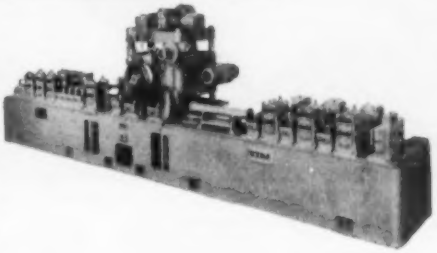
DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS • BELT and DISC SURFACERS • METAL-CUTTING BAND SAWS • SPINDLE SHAPERS • JOINTERS

TO MAINTAIN NATIONAL LEADERSHIP..

DAYSTROM.. requires UNIFORMITY IN MASS PRODUCTION of Chromed TUBING for Dinette Sets

ETNA TUBE MILLS DO THE JOB at the rate of 120 FEET PER MINUTE!

Rigid standards of quality prevail at Daystrom Furniture Company. And to suit their *individual requirements*, Etna engineers designed and manufactured tube mills to produce steel tubing for Daystrom at the rate of 120 feet per minute! Etna Tube Mills mean faster, more uniform production of steel tubing for end uses as divergent as furniture and gas pipe. Consult Etna engineers for tube mills specially designed and constructed to suit *your* tubing requirements.



MANUFACTURERS OF BETTER TUBE MILLS... BETTER SWAGING MACHINES... FOR MORE THAN HALF A CENTURY

THE ETNA MACHINE CO.

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This is a special Union 4¼" four-fluted drill for core work in cast iron.

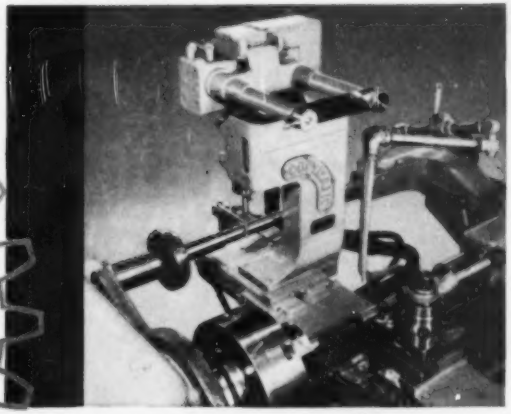
WHATEVER YOUR DRILLING JOB... large or small . . . there's a UNION twist drill that's *right* for your material and *right* for your drilling equipment. Let your Union Distributor help you choose it . . . and you'll be sure of fast, free-cutting performance, less chance of breakage and more work between resharpenings. So, put the "first team in drilling" to work for you . . . today.

FIRST TEAM IN CUTTING TOOLS . . .

UNION *and your Local Distributor*

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS • Milling Cutters • Gear Cutters • Twist Drills • Hobs • Reamers • Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers, Twist Drills . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates



"Annual Savings $10,000 to $12,000"

"Output Tripled"

... with the Lodge & Shipley COPYMATIC Lathe!

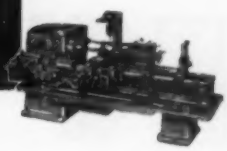
at
INDIANA GEAR WORKS, INC.
INDIANAPOLIS, INDIANA

This noted gear, cam and precision machine part manufacturer states that COPYMATICS have "greater versatility" and are "outstandingly fine tools. Overall time saved is 50%". On the operation illustrated, machining a tail rotor shaft for the Sikorsky Helicopter, heat treated AMS 6260-38RC steel is turned with tungsten carbide tools at 295RPM and .008" feed. Floor to floor time is just 30 minutes.

This case history is only one of hundreds of similar reports of time and costs saved by Lodge & Shipley COPYMATIC owners. Significant too, is the fact that large shops, small shops . . . owners of one or a battery of COPYMATICS . . . producing one or a wide variety of parts . . . find COPYMATIC the answer to their problems.

You too, can increase production . . . save time, money, floor-space and capital investment with the Lodge & Shipley COPYMATIC. Write for Bulletin 675 and file folder of actual case histories.

THE **Lodge & Shipley** COMPANY



MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Easily adjustable head and table speeds changeover from job-to-job...

New Heavy-Duty Alfing Drill Press

Immediate delivery from stock

Just turn the crank to raise or lower the table—slide the headstock 6" up or down by hand—lock in position—and the Alfing Drill Press is ready to go to work on your short- or long-run heavy duty production jobs. Easy-to-reach controls cut your handling time, too.

Built to take it, the Alfing Model BK-25 combines all the operating advantages that made it one of Europe's top producers for 40 years, plus many new design features to meet the operating requirements of American mass-production...like these:

Adjustable table and headstock. Scraped ways assure accurate alignment.

9" spindle stroke, driven by either V-belt or flange-mounted AC motor. Motor speed 900 rpm.

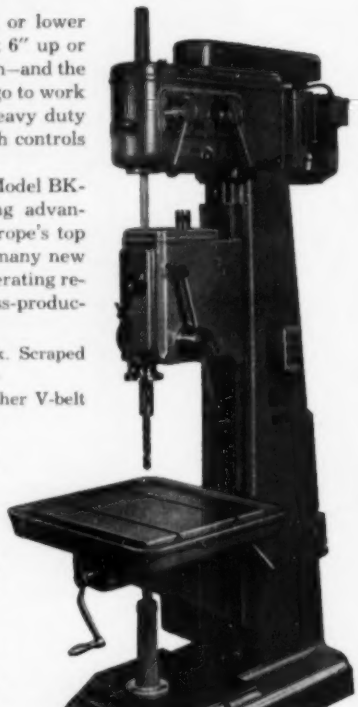
Drilling capacity of 1" in steel; 1¼" in cast iron.

Adaptable for boring, countersinking, milling and reaming.

8 spindle speeds from 150 to 1640 rpm in geometrical progression. Spindle carried in precision ball bearings.

Drilling feed by hand or power. With power, feeds of .003", .006" or .009" per spindle revolution are available. Power feed may be engaged or disengaged at any position of spindle. Drilling depth set by quick indexing stop.

Want more details on this and other Orban equipment? Write today.



New Alfing BK-25 Drill Press with 26" x 28" table surface. Distance between spindle and table, 23" max.; spindle and base plate, 25"-40".

AVAILABLE FROM STOCK

Delivery Helped Sell These Tools... Now Industry's Sold On Their Performance

Production-minded plants want more than just delivery on machine tools—foreign or domestic. They want performance—and they're getting it—reordering these German precision-built tools:

Twist drill life increased 10 times by user of CAWI TWIST DRILL GRINDERS...says savings will soon pay machine cost. For wet or dry grinding two- and three-lip drills 1/16" to 1" diameter.

New type web thinners, already very popular with U. S. plants – for drills up to 3" diameter. Also new type Twist Drill Grinder. Automatic oscillating grinding wheel assures fast, accurate, re-grinds and reduced wheel wear in ROHDE & DOERRENBERG machine. For drills up to 3" diameter.

Vertical milling, downfeed milling and jig boring in one set-up in HURTH V10A. A precision performer in leading American plants, producing close-limit jigs, fixtures, gages, etc. 13 spindle speeds, 45-2800 rpm; Table 39¼" x 11⅝".

Low-cost, high-production shapers...they amazed—and sold—ASTE Show visitors who saw the KLOPP'S unusual speed and capacity for removing metal. Now cutting costs in 15 U. S. plants. Stroke lengths, Mechanical 16⅝", 20⅝", 26⅝"; Hydraulic 26", 33½", 39½".

4-way tool grinder for ALL lathe and planer tools. THIELENHAUS GRINDER eliminates need for using well-dressed cup wheels for roughing operations. 4 separate motors, 8 grinding stations.

Small vertical broach has 2-ton pulling capacity. Rugged FORST BROACH with 31" stroke makes it a "natural" in place of larger equipment.

Specially engineered vertical millers for slotting, recessing and keyways. HURTH LFV is equally adaptable for normal milling. Table sizes: 48" x 13⅝" and 34¼" x 10½".

High cutting efficiency, easy-to-use power hacksaws. BERLETT machines with automatic feed are ruggedly built for trouble-free performance. 3 cutting speeds. Sizes: 6", 8", 10", 12" and 14".

Automatic Screw Machine by BMW...meets all U. S. operation and production demands. Collets interchangeable with American equipment. Bar capacity ⅞" diameter.

Patternmakers milling machine. Mills wood, aluminum, cast iron, steel—to 8' 6" diameter. No other machine like it. Built by internationally known BOHNER & KOHLE.

Lathes for every turning need – precision-built to American standards by Germany's leading lathe manufacturers.

HEAVY DUTY—Swing 17¾" to 24½"...turning lengths 40" to 78½".

EXTRA HEAVY DUTY – Swing 30¼" to 48⅛"...turning lengths up to 22' 11".

FINISHING LATHE—Swing 11¾"; turning length 19½".

FACING LATHE—built for Jet Engine work —Faceplate diameter 47⅛". Swing 47⅛".

ELECTRICALLY CONTROLLED LATHES —Swing 16"; turning lengths 36" and 60".

Replacement parts for all machines will be available at our Cleveland Service Center

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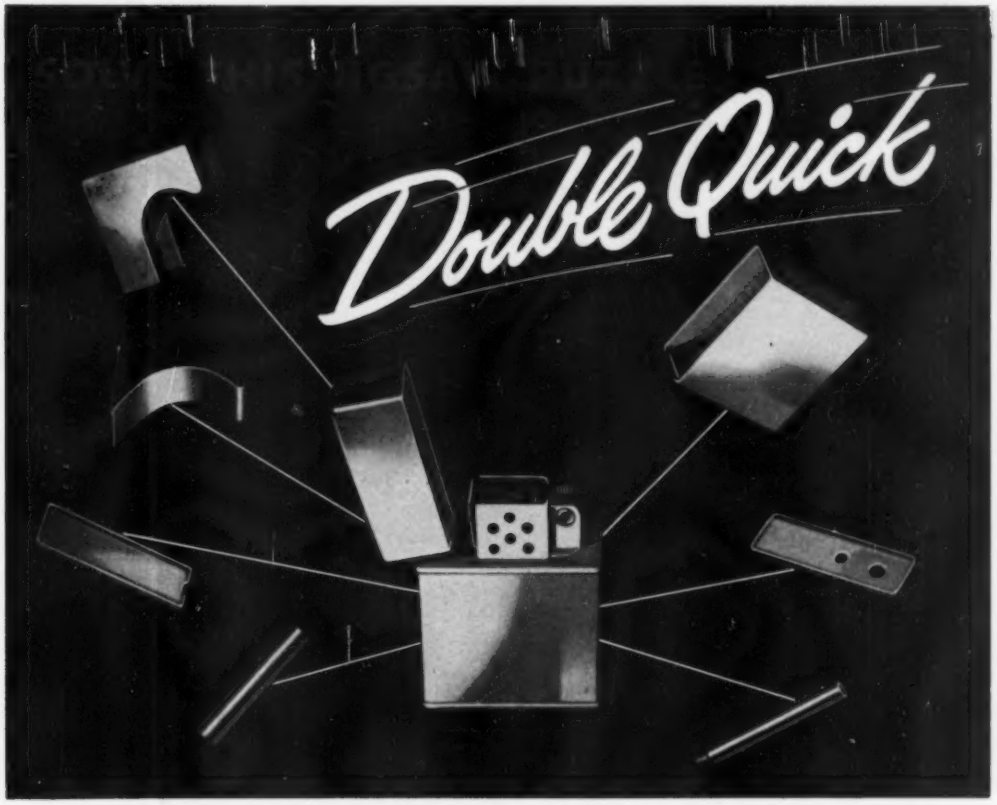

with TOCCO* Induction Soldering

The American Emblem Co. wanted to speed production, cut costs and reduce rejects in the assembly of their "Ruliter" Cigarette Ignitors. Look what happened when they switched from hand soldering to automatic TOCCO soldering!

COSTS DOWN—Solder cost reduced 50%—repairs and rework due to misalignment of parts cut 98%.

PRODUCTION UP—A 7½kw 9600 cycle TOCCO unit with conveyor type fixture heats one assembly every 20 seconds—twice the former output.

REJECTS ELIMINATED—Formerly rejects due to leaking seams and uneven heating were frequent. TOCCO has eliminated these completely.

TOCCO ENGINEERS—are glad to survey your soldering, brazing, hardening or forging requirements to see where TOCCO can save you time and money, too.

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Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering".

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HIGH SPEED HYDRAULIC COPYING LATHES

Only an absolutely rigid, chatter-free machine with built-in tracer device—*not an attachment*—can give you maximum output, accuracy and finish. For amazing speed in finish-turning without rejects you can depend on the H.E.B. designed for automatic copy-turning from the base up!

Costly down-time is eliminated with the H.E.B. Hydraulic Copying Lathe. Takes no more than 10 to 20 minutes for setting, and the finished parts are copy-turned up to 300% faster than on multi-tool lathes. Economical for short runs, too!

With its 20 H.P. motor the **OP Model** takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

Over a thousand of these modern copying lathes are now in use throughout the world. . . . Designed and built in France by H. Ernault Batignolles, machine tool manufacturers for almost a hundred years!

See for yourself how fast this revolutionary machine can pay for itself. For complete information, or to arrange demonstration in New York, Detroit or Los Angeles showrooms, call your nearest H.E.B. representative now!

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NO PRIORITY REQUIRED!

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"THE WAY TO TURN"

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COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

Whatever the job you're right with a DELCO!
Whether you need totally enclosed or open-end motors . . . fan cooled or explosion-resistant motors . . . you're certain to get the right motors on the job when you choose Delco.
Each and every Delco motor is designed and built for the job it has to do. It's made of the finest materials, and engineered to stand up longer under the roughest conditions.
So check up on Delco motors, now. You'll find Delco has the motors you need, and that Delco always meets its commitments. For full details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.
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Is your present abrasive method

Only CARBO

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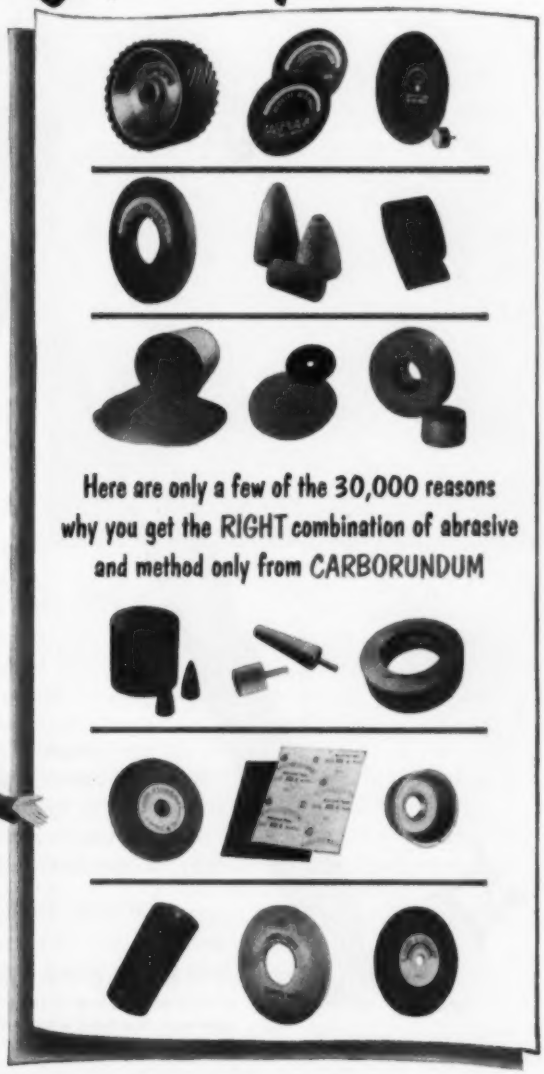
really good enough, today?

Chances are good that if you've been using the same method for a mere two years, there's now a better way. That's how thick and fast the new developments in abrasive techniques have come along. Every day someone, somewhere, is switching from one method to another, under the pressure of one hard economic fact: the need to cut costs.

Here lies the biggest advantage to the shop which has standardized on abrasives by CARBORUNDUM. You get counsel free from bias, for the CARBORUNDUM distributor or salesman represents the only producer of a complete branded abrasives line, famous for uniform high quality. Thus he can recommend on the basis of what's most profitable for you, not just what's most profitable for him. And he can keep you posted on all the newest practices of metalworking shops from coast to coast.

Make a mental run-down today of each abrasive operation your shop performs, then call in the man from CARBORUNDUM for his experienced, practical, unbiased counsel. You'll find him listed in the yellow pages under "Abrasives." Call him today—it's to your profit!



Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

RUNDUM

MARK

offers ALL abrasive products...to give you the proper ONE

test proves that *Better Wearing Qualities*

give you

42%

MORE HOLES PER GRIND

It was a smooth-running job—drilling 1⅛" holes in a cast iron cover, ½" thick—but the superintendent wasn't satisfied with the wearing qualities of the high speed drills that were being used. They averaged 2705 holes per grind. ◈ When a *Cleveland* Service Representative was called in, he recommended a stock CLE-FORGE High Speed Drill that is engineered to reduce the wear caused by abrasive action. With no change in feed or speed, this drill averaged *3862* holes per grind! ◈ On *all* drilling operations, a *Cleveland* Service Representative can help you *speed the job* and *cut costs*. Contact our nearest Stockroom, or . . .

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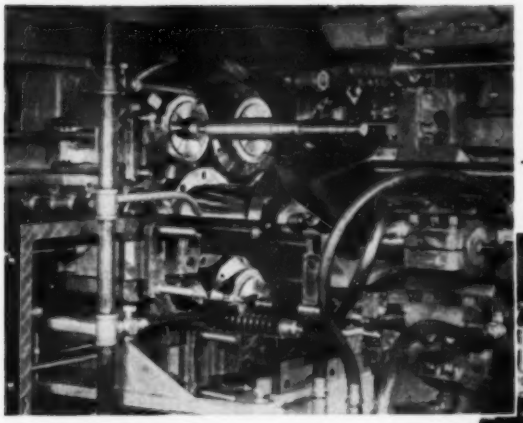
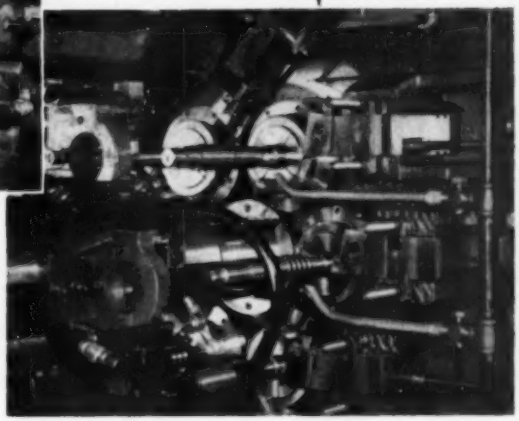
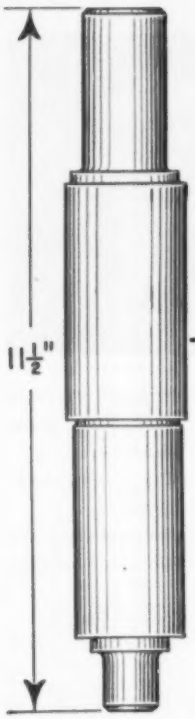
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



Tooling Area 3½ · SIX
Front Side Rear Side





Automotive Transmission Shaft

A very good reason why CONOMATICS handle a wider variety of machining operations per single chucking is their greater number of tooling positions.

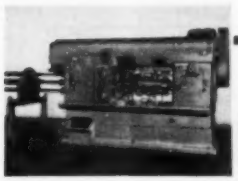
WITH MORE TO SELL THERE'S MORE TO TELL

Whether you're selecting a new golf club, motor car, or multiple spindle bar automatic, you want what best fits into the "scheme of things."

Before you can be sure that any product will meet your requirements you must have information. And you can judge only by that at hand or available. Complete information lets *you* decide what's important to *you*. That's as it should be.

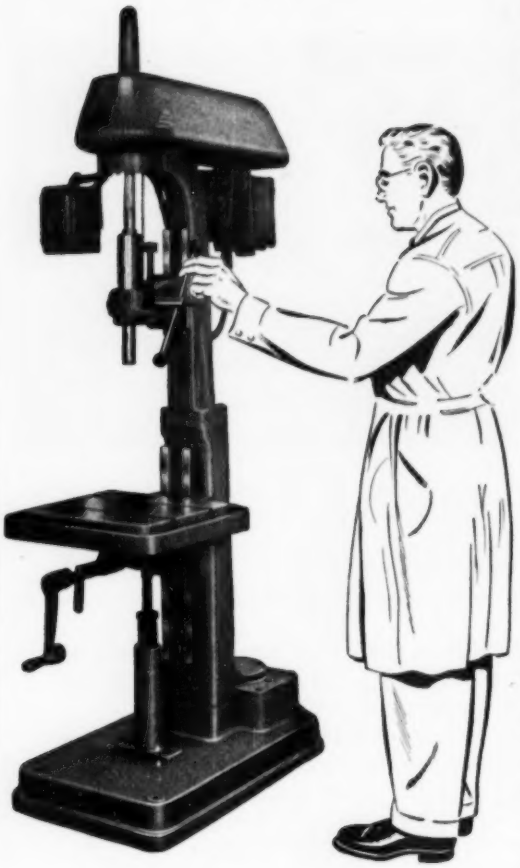
There's always more information to be had about the product that has more to offer. It's that way about CONOMATICS. And you can always have *complete* information. If you will write, wire, or phone, you can have it now.

A Comparison of ALL Automatics is in favor of Cone

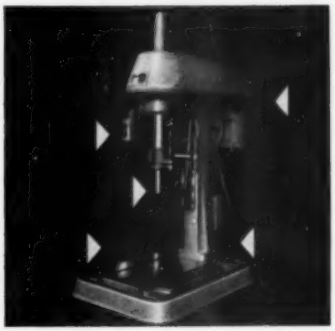


Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

you can even **feel** them 'make time'



You can tell by the quiet smooth operation of these C-O Cincinnati 16"-3000 drills that they're really built for accurate work, long hours, and consistently high earnings. High production . . . freedom from vibration and chatter . . . plus **the "feel" of a fine tool** are the end result of the extra features that make these drills **"of outstanding value."** And remember, this is just one of many machines available in the complete C-O Cincinnati line to meet all your drilling requirements.



Accurate, alloy steel spindle, mounted in a ground steel quill between permanently sealed high-grade ball bearings. Capacities up to 1" in cast iron.

Full floating drive transfers all belt pull to two additional ball bearings in the spindle pulley.

Hand-scraped head ways cast integrally with the frame provide rigid support for the head. (Counterweight concealed in frame.)

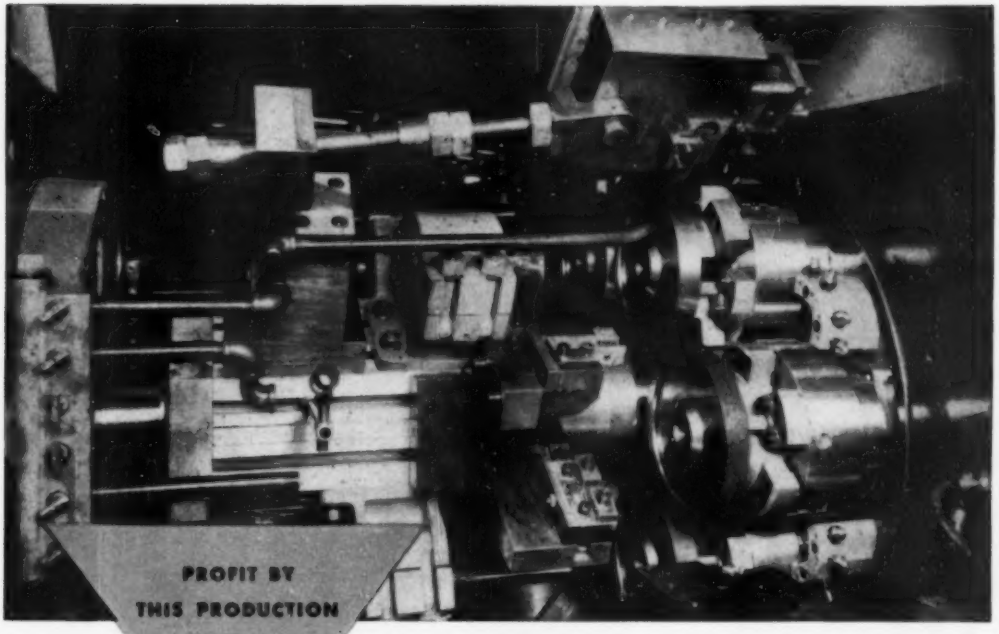
Tilting motor bracket permits easy belt shifting for speed changes without wrenches, helps maintain proper belt tension.

Positive, speedy spindle return is adjustable to changing job requirements.

Write for Catalog D-108 and the name of your dealer.

CANEDY-OTTO DIVISION

CINCINNATI 9, OHIO, U.S.A. **cincinnati lathe & tool co.**



PROFIT BY THIS PRODUCTION POINTER

FIVE SIMILAR JOBS ON THE SAME MACHINE, WITH THE SAME TOOLING

The advantages of automatic production are here extended to cover a broader range of jobs because Acme-Gridley machines are inherently versatile—can be changed over with a minimum of time and money invested in tooling, and yet offer maximum high speed production.

For example, on the job illustrated, changing over to any one of the five sizes of cam shaft gear blanks machined is speeded up and simplified by the use of special tool magazines. On the 10" six-spindle Model RPA used for this job, all facing tools are of the relieving type; the same reamers, tool bits and boring bars are used for all sizes—and machining time is only one minute thirty seconds for the 9" size blank.

This combination of efficient tooling and rugged construction, to take the fastest speeds and heaviest feeds modern carbide-tipped tooling can stand, is a characteristic of every Acme-Gridley Automatic. May we show you how they can increase your production and cut your machining costs?

JOB FACTS

PARTS —5 Sizes of Cam Shaft Gears (9" x 1⅝" size illustrated)

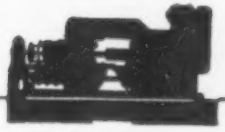
MATERIAL —Heat Treated Cast Iron

OPERATIONS—13

MACHINE —Acme-Gridley 10"—6-spindle RPA Chucker

TOOLING —Solid Carbide Inserts

MACHINING TIME—1 Minute-30 Seconds (for size illustrated)



THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

No other source offers a line so COMPLETE—so much design and tooling EXPERIENCE in Multiple and Single Spindle Bar and Chucking Automatics.

ARMSTRONG
TOOL HOLDERS

Equip with
ARMSTRONG TOOL HOLDERS
for Defense production

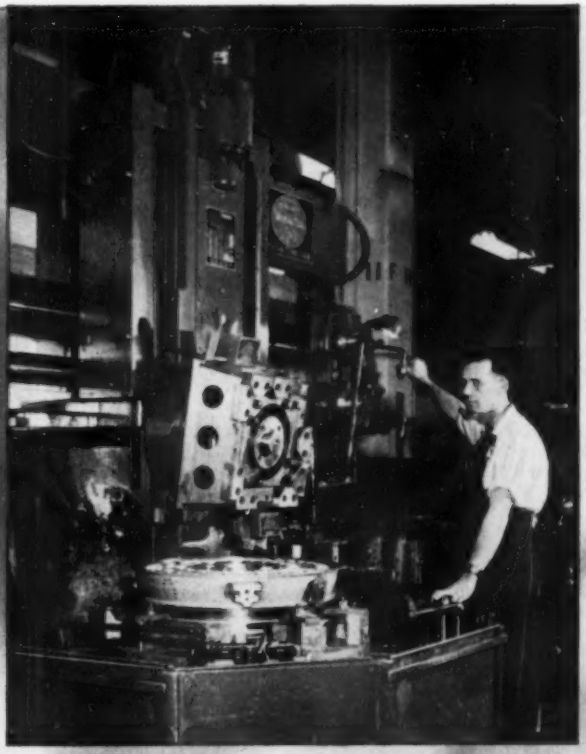
A change over to new products, starts in the tool room and the die shop . . . starts with ARMSTRONG TOOL HOLDERS. In preparing for defense orders, the logical first step is to check your stock of ARMSTRONG TOOL HOLDERS. With the correct types for every operation, and the correct sizes for each lathe, planer, slotter and shaper, you will be able to start work on a moments notice.

ARMSTRONG TOOL HOLDERS reduce "tooling-up" to the selection of a cutter and tightening of a set screw. They permit operation at higher speeds, and heavier feeds than are customary—they enable you to produce more pieces per hour, per man, per machine.

Produced by modern methods, in a specially-built tool plant, they are the lowest cost tooling you can buy. And, they are as available as your telephone for they are carried in stock by your local supply house.

Use ARMSTRONG TOOL HOLDERS wherever possible for lower tool cost, saving in High Speed Steel, increased output and greater profit. *Write for Catalog*

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



Pacemakers on the *Jet* PROGRAM

The inception of Man-Au-Trol Vertical Turret Lathe started a new manufacturing era in the boring mill field.

Man-Au-Trol manual or automatic control has taken the guess work out of previous manual operations on highly accurate repetitive work.

Automatic change of feeds and speeds at the proper instant, automatic change of direction of feed, automatic precision indexing of heads for succeeding operations — all contribute to the productive efficiency and minimum operator fatigue at a pace previously unobtainable in single spindle machines of the size and capacities of Man-Au-Trol.

For "set-ups" or shorter run jobs, manual operation is quickly available without disturbing the settings for the automatic cycle.

Learn about the manufacturing efficiency of this machine as applied to your work.

THE BULLARD COMPANY
Bridgeport 2, Conn.

L & I Reamers have a Wider Range of Standard Sizes

Large Sizes
TO 1½"

Small Sizes
TO .040

The Reamer Specialists
LAVALLEE & IDE, INC.
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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

We Did the Slipping

You were kind enough to publish a small article of mine "Traversing Friction Meter Checks Carriage Motion," (*AM* — June 9 '52 p 162). However, the text was changed to give the impression that the meter is unreliable in action, that it has been mounted on one lathe only, and that the power feed cannot be used while measuring because the jarring of the machine during traverse might make the roller slip.

This is a most unfortunate error, and I hope you will take my word for it that this meter has been adopted, after extensive testing, by our foremost machine-tool builder, Kopings Mekanista Verkstad. If it had failed at the friction point, as you suggest in the text, it would never have been put on their lathes. Several thousands of these indicators have been sold in the Scandinavian countries in the past 2 years, and there has never been a complaint about the roller slipping. It is most useful when the power feed is engaged. It is a real time saver, and steel scales and other measuring tools are used only to check the final dimensions. The device has been patented.

Incidentally, the name of the designer is H M Hultberg, not Multberg, as given in your article.

A E Fristedt
Stockholm-Bromma, Sweden

Labor's Burden

We are interested in locating some publication or pamphlet showing the amount of markup, or burden, over the cost of labor in the machine division of manufacturing plants or tool and die shops.

In other words, if the labor in the machine shop averages $2 per hr, what should be the price per hr to the customer?

M W Loomer
Independence, Kansas

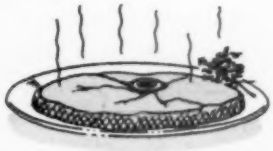
For information on the procedure for determinnig burden over direct-labor costs, we would suggest your referring to Production Handbook, *published by Ronald Press, 15 E 26th St., New York City.*

You might also find it advisable to get together with several of the other manufacturers in your community to discuss this problem and how it is being handled in their dif-

GRINETICS

BY D. G. SMITH

COLLAR



ARMOR PLATE

SCREW

(A THREAD, A HEAD & A PIECE OF ROD)

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THE right TOOL

Every mechanic knows the importance of having the right tool for the job.

In a hand operation, a good man can make up for deficiencies in his equipment by his personal skill and know-how. A machine does not have this skill. The Tool must be right. The men who design and build the tools must have the know-how.

For over thirty years the Micromatic organization has been developing, building, and servicing honing tools. Every Micromatic tool is engineered to give the greatest possible precision and productive life.

We have the right tool for your job. Buy from the organization with a complete line of honing tools for every type and size of cylindrical surface.

Write for the complete story of Microhoning Tools in "Cross Hatch."

Micromatic MICROHONING TOOLS

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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REPRESENTATIVES: Overgard Machine Tool Company, 838 Symes Building, Denver 2, Colorado
Hallidie Machinery Co., 3726 First Ave., South; Seattle, Wash. . REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

what products do you make that need *permanent*

✓MARKING
✓NUMBERING
✓GRADUATING
✓EMBOSSING
✓DEBOSSING

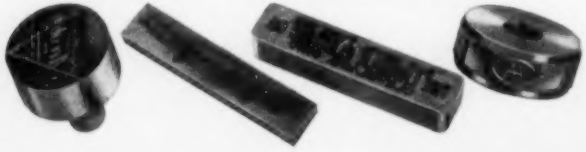
NOBLEWEST RAPID PRODUCTION EQUIPMENT WILL MARK THEM FASTER • BETTER • AT LOWER COST

Because Noblewest has kept pace with industry's demand for constantly higher marking speeds and lower costs per unit marked . . . Noblewest is, today, the world's leading manufacturer of rapid precision equipment for the permanent marking of metal, plastic, hard rubber, wood. Model 157 (illustrated), with new improvements, can be tooled for marking many sizes and shapes of pieces.

Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. For good impressions and long service, only the very finest of steel, carefully heat-treated, is used.

Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete details write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

A MARK IS ONLY AS GOOD AS THE DIE THAT MADE IT



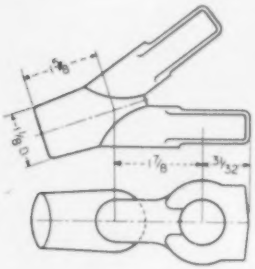
MARK IT BEST WITH NOBLEWEST Roll-O-Matic MARKING

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

ferent plants. Any figure we might give you would have no meaning, because of the difference in accounting procedures in various companies. The items that go into overhead in one company are often quite different from those of another company. For example, people who do materials-handling work in one company may be considered a part of direct labor, while in another they would be considered part of indirect labor. So, to establish any markup figure, one must know what elements of cost are to be included in it.—Ed.

Bent Holes

You recently published an article on the production of cored forgings, (*AM*—Oct 1 '51, p140), and one on hollow extruded forgings (*AM*—June 9 '52, p119). It occurs to me that you might be interested in this method of producing a hollow drop forging.

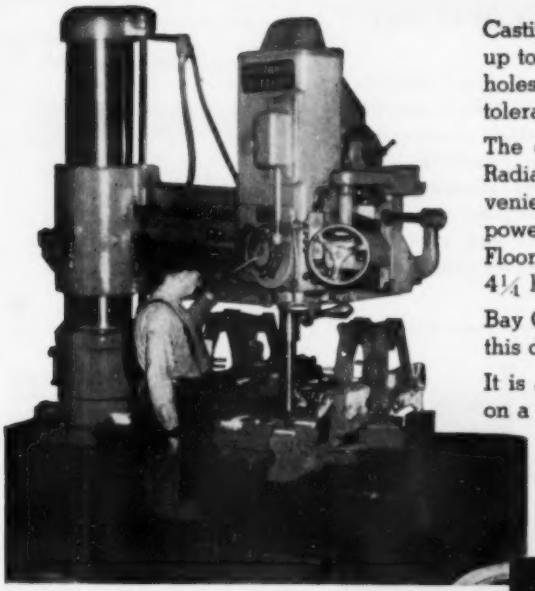


The part is a tubular linkage for cooling diesel-engine pistons with oil, and was originally planned as a steel casting. Because of the difficulty of obtaining castings, however, it was produced from a forging in the following steps: First operation was to drill the ¾-in. holes in the two eyes. Then one ½-in. hole was drilled in one leg, holding the work in a jig on an engine lathe.

The hole was plugged with a steel plug to provide material for guiding the drill, and the second leg drilled in the same manner. The shank was then bored and counter-

BAY CITY SHOVELS, INC. BOUGHT...

low upkeep...ease of handling...increased production



This 7' Super-Service Radial is one of 10 Cincinnati Bickford drilling machines at Bay City Shovels, Inc.

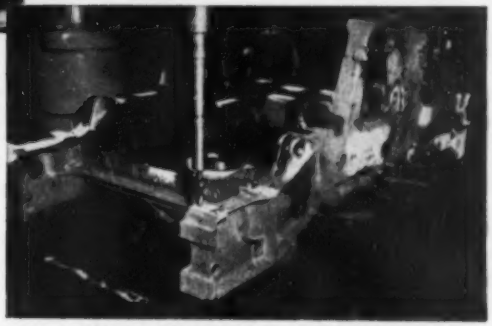
Castings 4' wide by 10' long, and weighing up to 3800 lbs., are handled on this job—65 holes are drilled on one set-up, with .003" tolerances.

The ease of handling of this Super-Service Radial, its accuracy, power and operator convenience have increased production on these power crane and shovel revolving bases. Floor to floor time cut from 6½ hours to 4¼ hours.

Bay City Shovels, Inc., states the upkeep on this drill has been low.

It is another example of a fine tool working on a fine product.

Write for Bulletin R-29, or consult our Engineering Department. Your drilling problems are our problems.



41/64", 1/4" and 1-61/64" diameter holes are being drilled in this illustration

A Bay City one-half cubic yard power shovel. Photos courtesy of Bay City Shovels, Inc.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

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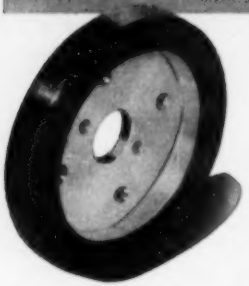
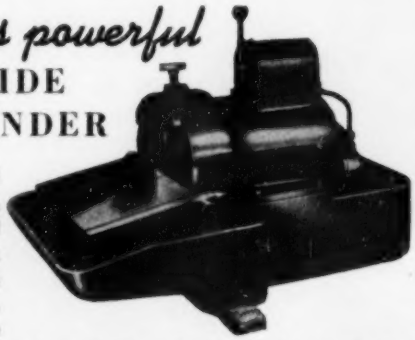
Grind More Carbide per Carat of Diamonds



...with STEEL-BONDED DIAMOND WHEELS

Wickman-Neven Steel-Bonded Diamond Wheels stretch wheel life—lower your carbide grinding costs because they're practically indestructible. They can't be damaged even by plunging sharp-pointed tools into them. Diamonds stay in place until worn to give more cuts per carat. These wheels also give up to 300% longer carbide tool service by producing a strong, uniform cutting edge that resists breakdown.

...and this powerful CARBIDE BENCH GRINDER



Ideal for all off-hand carbide tool grinding, the Wickman Model GF-2A is heavily built for years of service even by unskilled help. The 1 HP direct-drive motor is quickly reversed, and the wheel guard swivels for right- or left-hand grinding. A built-in coolant pump delivers 12 GPH; primer and strainer are also included. This machine comes furnished with a steel-bonded diamond wheel of your choice. Protractor also available.

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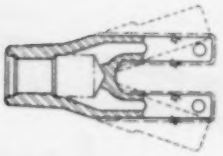

bored, and the two legs were closed in and partially flattened under the forging hammer. This operation was done hot. Final operations were to counterbore and tap the shank end, bore the two eyes, and drill, spotface, and split the fork ends.

John F. Morrison
Ozone Park, LI, NY

Spaghetti Marking

In reference to your article, "How Sperry Harnesses The Electron," (*AM*—April 15, '52, p143) please be advised that the reference to the use of ordinary typewriter ribbon for marking identifying sleeves on vinyl tubing (spaghetti), is inaccurate.

Sperry Gyroscope Co has been using our specially formulated Indelident Ribbon for the past year and a half. This ribbon is compounded with basic solvents of vinyl resins that bite into the tubing to produce permanent markings that cannot be rubbed off, or dissolved in gasoline, oil, grease, or salt water.

We manufacture the only ribbon made specifically for imprinting on vinyl plastics, which can be removed only by solvents that dissolve the plastic itself. The ribbon is used in conjunction with a heatless marking machine, the Kodifier, which we developed and manufacture.

Bernard J. Kappler, president,
Markwik Mfg Co, Inc
Bronx, N. Y.

You are quite right in what you say. Our mistake occurred because Sperry apparently needed additional spools and used a Burroughs adding machine spool in one case, and an Underwood in another.

Thank you very much for calling this mistake to our attention.—Ed.

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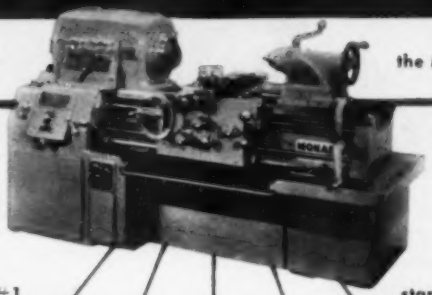
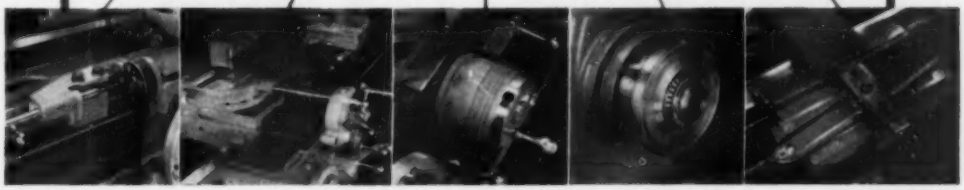


the Monarch series 60 lathe

standard variation #1
series 60 plus—swing models

standard variation #2
series 60 long bed models



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SPOT NEWS of Metalworking

- **First real effort to coordinate European plane production** among British, Dutch and Italians is being made possible by US agreement to $220 million of offshore purchases. An even larger sum in European currencies will be provided. Washington agrees to commit the money on two conditions: (1) Planes must be delivered by end of 1955; and (2) US is not to furnish any scarce machine tools for the program. French are not likely to participate, as they cannot get their production "off the ground" by 1955.

- **French are seriously pushing development of a long-range program** for building up an aircraft manufacturing industry in northern Africa in conjunction with the Germans. This is a sort of Schuman plan for aviation and is outside the offshore purchasing program.

- **Speed run of "The United States" across the Atlantic was not just for fun.** It shows what could be done in time of war. It also has sparked demand for building of much faster tankers and cargo ships for wartime use.

- **Steel situation will be badly snarled until mid-1953,** even if strike ends soon, top defense officials believe. DPA-NPA will spend most of that time straightening out steel supplies for direct military, atomic energy and machine tool needs, in that order.

Shell-molding applications must be on a piece-by-piece basis rather than used generally, General Motors officials have concluded from a study of the process. High cost is the big problem. Thus, thorough study must be made before the process is applied to any specific item.

- **Captured MIG-15, USAF finally reveals, shows top engineering** and fabricating done by Russians. Rolls Royce Nene engine bought from British has been boosted over 20% in thrust rating, with water injection added. Stainless steels in engine are good, withstanding up to 1600 F. Welding, particularly of three layers, is excellent. Little cockpit armor and no extra instruments killed two tons of useless weight, allowing 10,400-fpm rate of climb.

- **Scrap scarcity is due by next Spring,** dealers say. There won't be enough scrap available to support 100% steel production after strike ends; besides, prices for scrap now don't spur real searching for it. One faint hope is continued scrap location during strike to build up backlog, but expectations are not high on this score.

- **New look at fast tax writeoff is in the works.** Tip-off is defense-mobilizer John Steelman's recent quarterly report. He has two complaints: Basic industries are not expanding as much as desired, despite approval of five-year amortization for part of the cost of $21.3 billion in new plants. Some expansion is simply modernization, too.

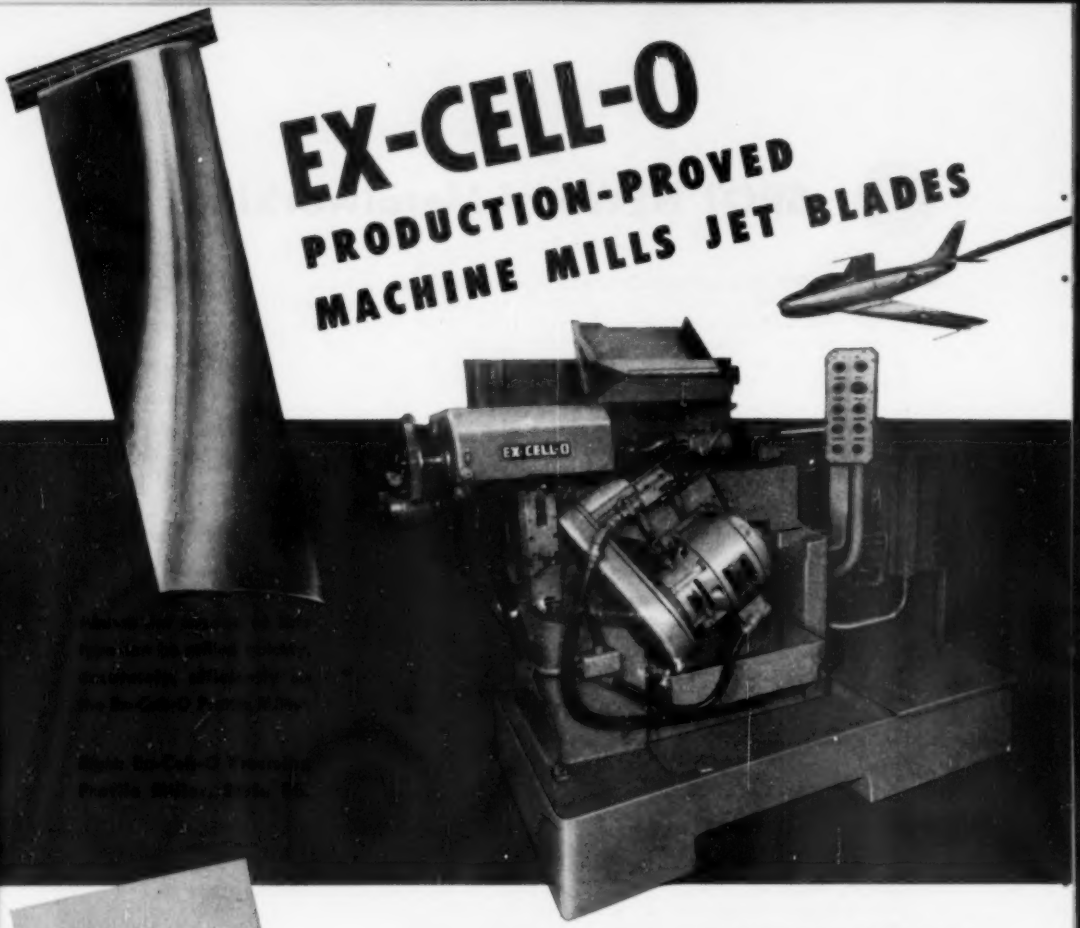
Ultrasonic process of grinding hard materials, particularly jet-turbine blades, is being explored intensively by Washington agencies as desirable method of speeding up production of jet engines.

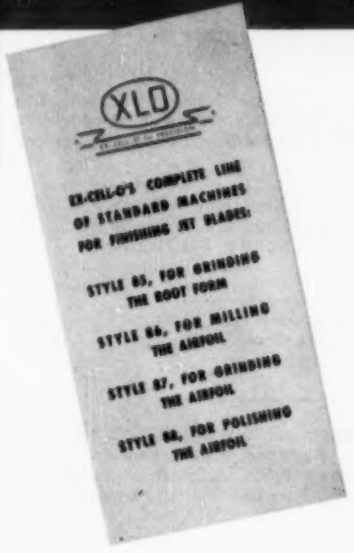
- **Munition Board is in front of opposition to issuance of critical list** of machine tools in connection with amendment of NPA's M-41 to permit shipment of unrated machine tools. Argument is that amendment itself accomplishes same objective without the list. Amendment may come out with list or without it. Opposition to the list developed unexpectedly at meeting of interagency government committee on July 11.

- **Germany is producing an all-metal glider, first since the war.** Maker is Ernest Nipp & Co, operating in old Focke-Wulf plant in Bremen. Design is by F B Lane, American in Civil Aviation Division of High Commission for Germany. Ship is a two-place trainer, weighing and costing less than any German competitor.

EX-CELL-O

PRODUCTION-PROVED MACHINE MILLS JET BLADES




XLO
EX-CELL-O'S COMPLETE LINE OF STANDARD MACHINES FOR FINISHING JET BLADES:
STYLE 85, FOR GRINDING THE ROOT FORM
STYLE 86, FOR MILLING THE AIRFOIL
STYLE 87, FOR GRINDING THE AIRFOIL
STYLE 88, FOR POLISHING THE AIRFOIL

MILLS COMPLETE AIRFOIL, *INCLUDING LEADING AND TRAILING EDGES*—AUTOMATICALLY

Here is a production-proved machine for automatically milling the complete airfoil form (including leading and trailing edges) of jet engine compressor blades. An outstanding feature is the use of back rests that support the blade rigidly throughout each cutting stroke to prevent deflection of the blade by pressure of the milling cutter.

The Ex-Cell-O Precision Profile Miller, Style 86, is hydraulically operated and fully automatic except for loading, unloading and pressing the start button. The airfoil form is generated by a master cam made from the engineers' glass layouts. The work travels lengthwise across the milling cutter and is indexed after each cutting stroke, the indexing and cutting being repeated until the part has rotated 360 degrees.

For further information and detailed specifications on blade finishing machines write, wire or phone to Ex-Cell-O in Detroit.

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DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

61-50

Washington

Cost of the steel strike adds up to another slowdown of mobilization, more months of controls. That's about all you can be sure of until steel output is normal again.

• • •

Arms output is still at pre-strike levels generally, though some specific items have slowed to a trickle. That's because of heavy inventories held by military, as well as most civilian producers, when shutdown started.

Worst hit are weapons taking special steel — high alloys, heavy castings, tubing. Such steel never was in abundant supply. Users were working with slim inventories—if any.

• • •

Big impact is ahead, throughout the next twelve months. Arms makers now need the steel they ordered before the strike. That means production schedules will have to be cut back. Even with priority help from the controllers, it will take months to catch up.

Military production will get priority on first steel produced. But that won't help too much. Nonmilitary users don't compete much for the types needed for most weapons, anyhow. We just don't have the capacity, the alloys to turn out enough military to catch up fast.

• • •

Components represent another sore spot. That is where military-civilian competition is the keenest. Even with CMP, the controllers still have found no way to assure sufficient common components for defense production.

Controllers have a plan. It's modification of so-called input-output method, designed to estimate metals requirements for changing military demands. With this mechanism—the controllers hope they can keep allocations high enough to meet all military and most civilian needs for components without resort to other controls.

• • •

CMP will stay for another year, if not even longer. DPA-boss Fowler already has formally abandoned plans to drop allotment of steel next January. Here's why:

It will take six months to catch up—get defense and defense-supporting production up to pre-strike schedules. Then there will still be snarls in some supply lines. DPA figures tight control of steel use will be needed to make sure military gets what it needs.

• • •

Pinch on civilian producers comes later, too. Consumer-goods makers will get bulk of steel they ordered before strike. It's virtually impossible to change mill schedules on most of it. But then controllers will insist on the following priorities for steel: First, arms; Second, oil, electric power, and other defense-supporting production; Then public health and safety requirements.

Political pressure on DPA will be heavy. With the election near, politicians will demand more metal for big consumer-goods industries. DPA expects trouble, but promises to hold fast.

• • •

More government plant is Steelman's threat to get the kind of industrial expansion he wants — chiefly for production used almost exclusively by the military. But it's just bluff — Congress won't stand for it.

Government guarantees to use excess plant are being considered. Whenever a plant, say for an exclusively military component, runs out of regular defense orders, the services would place additional orders, just enough to keep the plant in operation. Finished products would be stockpiled as extra reserve.

• • •

Joint chiefs will redetermine air-power assignments in August. New thinking will revise present top preference for the strategic air arm. Reason is that strategic air power is proving too costly in terms of superbombers like the B-36, whose value has yet to be proved.

So, joint chiefs will recommend more emphasis on light and medium bombers. Navy will also get bigger air-power share. Naval aviation will be assigned more functions, like coastal bombing and a bigger role in tactical air support.

Reason is that General Nathan Twining, acting chief of staff of Air Force, believes in balancing air power between tactical and strategic. He will avoid interservice fights.

• • •

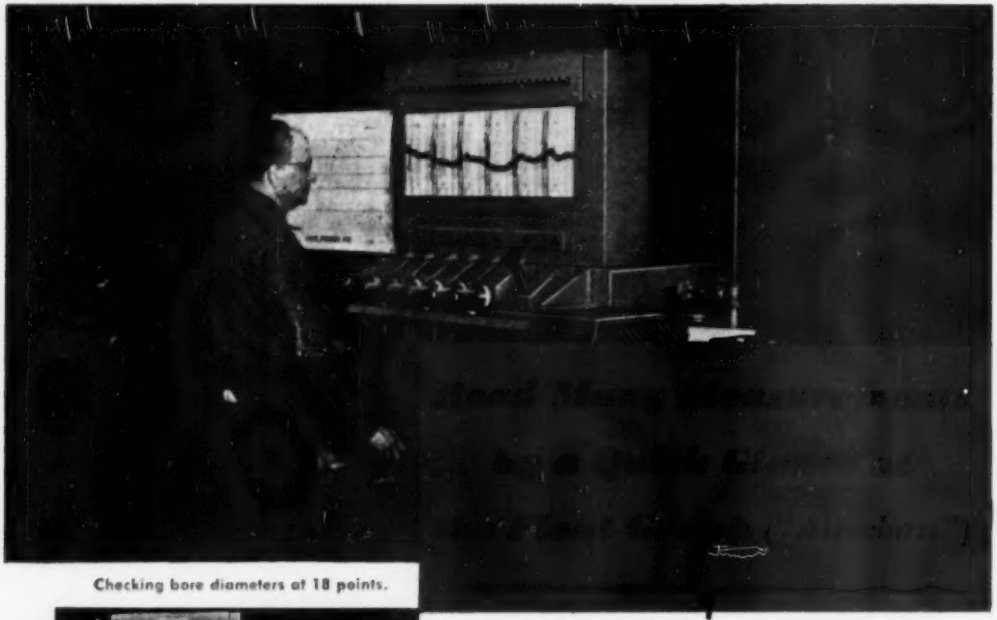
Big changes in wage and salary controls were made by Congress in extending the Defense Production Act until April 30.

Most important are the exemptions. Pay of most professional engineers, architects, and public accountants is no longer under control. Nor is any pay up to $1 an hour.

Small shops, employing eight or less, were decontrolled, too, unless President Truman makes an exception for a particular industry, job, or area. As during the war, it's likely an exception will be made for the tool-and-die industry.

Besides losing authority over any kind of labor dispute, the wage stabilization board can't issue policy regulations, either. It can only recommend them to stabilzer Putnam.

Actually, stabilization won't amount to much anymore. Not only have WSB's powers been clipped, but Congress gave it only enough money to run a skeleton operation.



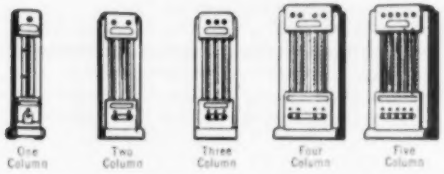
Checking bore diameters at 18 points.

Checking 27 crankshaft measurements.

Checking contour
of a turbine blade at 18 points.

Each individual measurement is indicated by the position of a float in its respective Precisionaire column.

The float positions form a characteristic pattern similar to a graph. It's actually a quality control chart. The inspector sees at one quick glance whether the work part can be passed or should be rejected, and for what dimensions. No eye strain, no close concentration, no figures to remember, no confusion of multiple dial faces with the "Airechart."



Standard Precisionaire column instruments are made with one, two, three, four or five columns. Special Precisionaires can be built to include from 6 to 30 or more columns depending on the number of dimensions to be checked.

For complete details on simultaneous multiple measurements with the Precisionaire, call your local Sheffield representative, send prints to us or write for Bulletin CTP-491.

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GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTOUR SHAPERS • TOOLING TOOLS

Detroit

The steel strike is hitting Detroit amidships. Automobile production entered July at a rate around 26,000 cars and trucks a day, U.S. and Canadian plants included, but began to dwindle at the turn of the month. By the time this appears in print practically every company will be down on automobile production—if not completely down, then nearly all of the way.

No immediate improvement is in sight, regardless of when the steel strike terminates. One major company figures its lead time at 3 weeks, which is about average.

There may be apparent exceptions to this rule. Some steel is known to be completed and awaiting shipment from strike-bound mills, and will be moved the day the strike ends. It might give manufacturing a momentary shot in the arm, were men to be recalled immediately, but thereafter will come the inevitable lag. Don't look for any substantial automobile production before August, at the earliest.

• • •

New-model introductions, in some doubt because of the steel strike, are probably going to be held off. Best belief now is that present-model runs will be extended, using up commitments already made on parts. Chevrolet dealers, for example, are hearing that their new models, originally scheduled for late in the year, will not be appearing until January.

• • •

There are reports that General Motors plans to resume in January '53 its annual automobile shows in New York at the Waldorf. None has been held since '50. A resumption is probably due to belief that the market is getting more competitive, that the razzle-dazzle and promotional values of big shows such as the Waldorf will be highly worthwhile.

• • •

Car shortages are expected as a result of the steel strike. Deliveries have been running at the rate of a half million units a month, and at that rate the field stocks—substantial before the cutbacks on production—have rapidly been melting away. Prices of used cars have been stiffening, meanwhile—an apt indication of the law of supply and demand.

Steel is the headache for some time to come. Just before the strike began, inventory studies now disclose, special bar-aluminum stock was definitely the top headache for the purchasing agents. Maybe by the time steel comes back into balance that item, too, will be more easily available.

• • •

Chrysler has introduced a new torque converter for six-cylinder cars, going on the smaller Chrysler models. One variation from standard practice: The torque-converter oil system is integral with the engine oil system, so drivers need change oil only twice a year normally (because the engine is drawing upon a larger volume of oil).

General Motors Research Laboratories have opened their new experimental foundry at the G.M. Technical Center, northeast of Detroit. The new metallurgy building, equipped for experimental melts of all common metals, is really a dream operation — abundantly lighted, air conditioned, thoroughly mechanized.

Nash-Kelvinator is planning a new factory at Grand Rapids, evidently to replace its present, rather old facility for manufacturing Leonard refrigerators. In addition, the new plant would produce stove assemblies; Nash-Kelvinator recently purchased the machinery and inventory of the Kalamazoo Stove Co.

Saginaw Steering Gear Div. of General Motors is reported optioning land in Saginaw for a new plant there. The facilities, which will substantially enlarge those already at Saginaw, would appear to be partly an outgrowth of increased demand for power steering.

• • •

Automobile prices may go up shortly, due to permission to figure on a new basis. Prices were previously limited to an industry-wide kind of level. Now, a new OPS regulation will permit dealers to figure their own markups individually, based on their pre-Korean margins.

Canton Forge Div. of the Ford Motor Co. has begun engineering on a large plant-expansion program; a new tool and die department, relocated and enlarged maintenance department, revamped heat-treat, shot blast and inspection shops. Objectives: More forging capacity, flexibility.

The big Willys-Overland forge shop at Toledo is enlarging again; two big forge hammers have already been installed to produce airframe and engine components, and 9 others will be in place by next spring. At that time, employment will double to about 1,000 men.

Kaiser-Frazer is now in production on parts for Chase C-123 airplanes; Willow Run will be the site of manufacturing for about three-fourths of the C-123. This will require fabrication of between 9,000 and 10,000 detail parts, and some 2,500 assembly operations.

• • •

General Motors has now reached its position of World War II in diversity, though definitely not in quantity. It is building tanks, tank transmissions, rockets, instruments of all sorts, shells, and cannon.

Track-type mounting for long, straight sweeps.
Full round base gives ample space for large work pieces.
4-way base gives four work stations.
Revolving jigs and fixtures give better drilling results faster.

get production flexibility and speed with

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When you buy Carlton, you get the widest possible choice of radial drill capacity . . . for there are 4 different models with an almost unlimited number of column and arm sizes.

And special track-type mounting, seven different types of stationary bases, plain or uni-tilt tables, and revolving jigs . . . are available at slight additional cost . . . to help you increase your hole production.

For complete information, send today for descriptive bulletins.

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Only one can be called the finest

Machine Tools

After an unexpected and prolonged delay, the amendment to NPA's M-41 permitting shipment of unrated machine tools has gone through.

It took considerable time to make up the list of critical tools to be excluded.

• • •

Then the Munitions Board voiced opposition to the issuance of any critical list along with the amendment at a meeting of the government interagency committee on July 11.

MSA backed up the Munitions Board's contention that the amendment itself, which clearly sidetracks any unrated order in favor of a rated one, takes care of the situation and that a critical list is superfluous.

When this page went to press, the controversy about whether there should be a critical list had been tossed back into the laps of NPA's high echelon for a final decision.

• • •

The critical list, about which so much heat has been generated, is reported to include:

Vertical boring and turning machines, 54 in. and larger; all automatic-cycle boring machines; horizontal boring, drilling, and milling machines of table, floor, and planer types with 4-in. spindle and larger;

Jig-boring machines; diesinking machines, both manual and automatic types; all radial drills; gear hobbers, 6x10 in. and smaller;

Long-bed surface grinders with 60-in. travel and larger; table-type rotary surface grinders with 30-in. capacity and larger;

Jig grinders; face-coupling grinders; duplicating and tracer lathes; saddle-type turret lathes, 3½-in. bar and larger.

No. 4 milling machines and larger, both column and bed type; planer-type milling machines; duplicating milling machines;

Skin millers; spar millers; jig millers; double-housing planers 60x60 in. and larger; open-side planers, 40 in. and larger; draw-cut shapers.

Altogether, 47 machine-tool builders are said to be affected by the list, if issued.

• • •

The question is whether the amendment, once issued, will be of major help in keeping the machine-tool industry at a reasonably high level.

The steel strike has been injected as a factor. Steel will be tight for some time ahead, long after the strike ends. And NPA's chief worry is how to supply enough steel to defense and defense-supporting industries.

NPA's top command is in a mood, under the circumstances, to make a distinction between the makers of critical tools and non-critical tool builders. The former would retain present high priority on steel; the latter would be dropped down to a lower status.

• • •

NPA's Metalworking Equipment Division will strenuously oppose any action to put this distinction into effect. The machine-tool industry also is dead set against the proposal.

Main argument against such action: That tools which are non-critical today may be critical tomorrow. It is necessary to maintain the industry's organization and operations high enough to meet any emergency which might develop.

Complicating the situation is a fresh demand for big, long-leadtime machines for two new defense projects which will be piled upon existing backlogs. About 15 builders will be affected by this new development.

One project is in connection with conversion from one tank model to another. The other is a Navy project which is still hush-hush.

• • •

While the Air Force intends to move machine-tool procurement from Wright Field to Warner Robbins depot at Macon, Ga., it plans to retain at Dayton the department which writes specifications. This department is part of Air Research and Development Command, not of Air Materiel Command.

This will create "an unholy mess," as one observer put it. Machine-tool specifications will be prepared at one spot and machines will be bought a thousand miles away.

Machine-tool people are pointing out that location of procurement at Macon will be costly, inefficient, inconvenient, and complicated from the standpoint of both the government and of the Air Force.

• • •

General Services Administration has not yet had to take over any machine tools under pool-order contracts, despite contrary reports.

It expects to do so before long, however. Latest figures on pool orders, up to May 31, are:

111 contracts for 94,657 machines valued at $1.3 billion have been awarded.

Shipments totaled 22,124 machine tools worth almost $215 million.

Some $146 million of pool contracts are pending, involving 11 firms. Nine new contracts have been let since May 31, but the dollar volume is not available.

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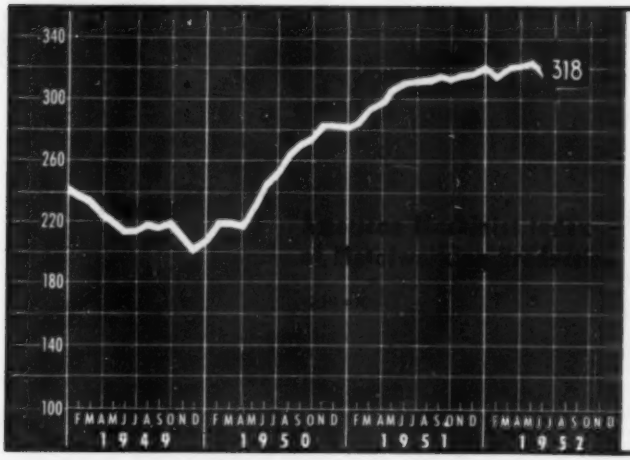
Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUNE '52*	MAY '52(p)	APR '51(r)	MAY '51
	318	**318**	**318**	**309**
Machinery	315	318	302	
Electrical Manufacturing	347	350	358	
Automobiles, Trucks	231	226	245	
Transportation Equipment	515	503	373	
Other Metalworking	306	309	321	

* Estimated (p) Preliminary (r) Revised

The steel shutdown is beginning to cut deeply into metalworking production.

Defense plants have hardly been affected. But companies making civilian items have been forced to close, reduce working schedules, or cut forces.

The situation is confusing in many spots, like Cleveland. Vacation closings are so intermingled with shutdowns caused by lack of steel that it is hard to distinguish one from the other.

• • •

Steel warehouses are about cleaned out of steel. One big distributor, for instance, had on hand at mid-July only 800 tons of badly balanced steel items.

The scramble is on for foreign steel. Importers' offices are swamped with inquiries. One company expects to get 10,000 tons of German steel every six weeks and is promising 2-3 months' delivery.

A good measure of the scarcity of steel: "seconds" are being grabbed up almost as fast as prime steel these days.

Conversion steel will be resorted to by some users to ease the situation as soon as the strike ends.

• • •

Michigan gray-iron foundries are getting pig iron from Canada to relieve the growing scarcity.

Other foundries are being kept in operation by government redistribution of pig iron.

Foundries in general still are running, but many are on a short work-week. Shutdowns are likely to come from customers' closing, rather than from materials shortages.

• • •

Steel-castings people report production still normal. But they are starting to get "hold" orders from customers. Shortage of pig is being partly offset by deluge of scrap at softening prices.

July allocations of refined copper to brass mills and foundries are biggest since start of controls. Under new regulations, refined copper consumers can buy only 60% of their quotas domestically.

NPA guesses that consumers will take their full allotments of higher-priced foreign copper in July and August. On this assumption, copper is off NPA's "most critical" list.

Fourth-quarter allocations will be larger than those in third quarter.

• • •

Aluminum supplies for fourth quarter should be bigger than in third quarter. Tonnage for both military and civilian uses should be ample by second quarter of next year.

Amount of alloying metals available shows improvement and more liberal allotments are in sight. Nickel, molybdenum, and cobalt are the exceptions.

Screw-machine-products industry's chief worry is to get an increase in price for its copper and brass goods. Its backlog has risen the past 60 days from 14 to 16 weeks.

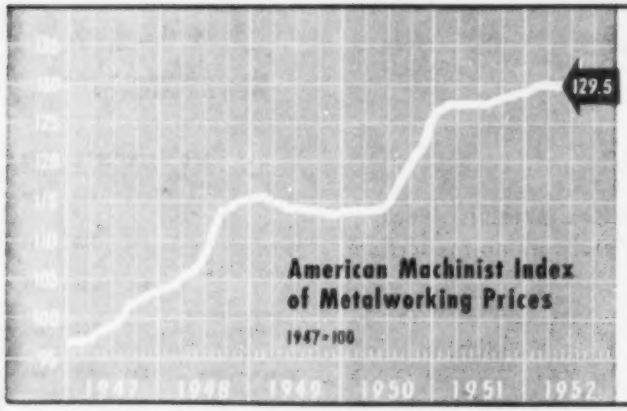
No ill effects have come yet from the steel strike. Outlook is reasonably good.

There has been a marked falling off in new orders for most durable goods. And the pile-up of orders is not nearly as high as it was.

The decline in production in many machinery lines is noticeable too.

But it still is the durable-goods group, aided and abetted by the military program, that is keeping Metalworking up where it is.

Gaging Business



PRICE INDEX

	JUNE '52*	MAY '52	APR '52	MAY '51
	129.5	**129.6**	**129.7**	**127.8**
Metalworking Machinery	**136.6**	**136.6**	**133.7**	
Other Machinery except Elect.	**132.5**	**132.5**	**132.1**	
Electrical Machinery	**125.9**	**125.9**	**126.8**	
Fabricated Metal Products	**127.8**	**127.9**	**124.8**	

* Estimated

Industrial production should head upward in the second half of this year.

The peak probably won't be reached until the first quarter of 1953.

This is the outlook as influenced by the steel strike. Steel mill shutdowns are playing hob with third-quarter production schedules.

• • •

Industrial output, as measured by the Federal Reserve Board index, dropped off to 202 in June.

It should rise to about 225 by the end of the year and perhaps go to 230 later on.

Chances are that it will not get above 230, however, unless new factors are introduced.

• • •

Easier credit terms have given business a desirable shot in the arm.

Sales of consumer durable goods went up in May and June. Installment credit rose $447 million during May, with automobile dealers accounting for $193 million of the total.

Factory work-week is almost down to the pre-Korean level. In May 1950 workers put in just under 40 hr at manufacturing plants. The score in May 1951 was 40.7 hr.

Hourly earnings of workers went up 4.5% in the year from May 1951 to May 1952.

Wage rate adjustments were entirely responsible. But hourly earnings did not rise in May. Average hourly rate: $1.66.

• • •

Weekly earnings are another story. Because of the reduced work-week, they were only 2.5% higher in May than a year ago.

Gross weekly wages of factory workers: $66.32. In the durable-goods industries the take-home pay was $71.11, substantially higher than in non-durable industries (only $56.90).

Manufacturing employment in May dipped from April 1952 and May 1951 levels. The decline was "across the board," affecting all types of industries.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	217.3	218.4	232.6
Steel ingot production (thousand tons)	307	277	2,029
Electric power output (million kilowatt hours)	6,453	7,318	6,077
Production of automobiles and trucks	87,052	134,337	98,087
Engineering construction awards (*Engineering News-Record*, millions)	$381.7	$223.2	$361.0

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	264	255	348
Vacuum cleaners sales (thousands of units)	217	217	202
Washers sales (thousands of units)	214	217	254
Household electric ranges sales (thousands of units)	69	70	110
Radio production (thousands of units)	980	848	137.3
Television production (thousands of units)	373	323	339
Gear sales index (1935-1939 = 100)	425.9	478.7	667.1
Foundry equipment new orders index (shipments, 1937-1939 = 100)	225.2	385.1	431.7

* Seasonally adjusted.

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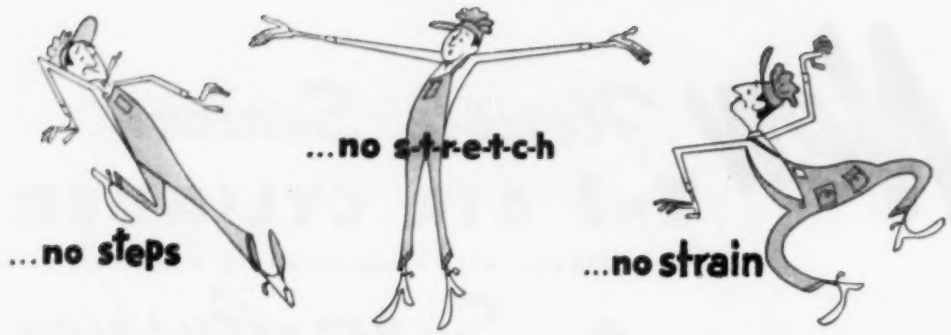

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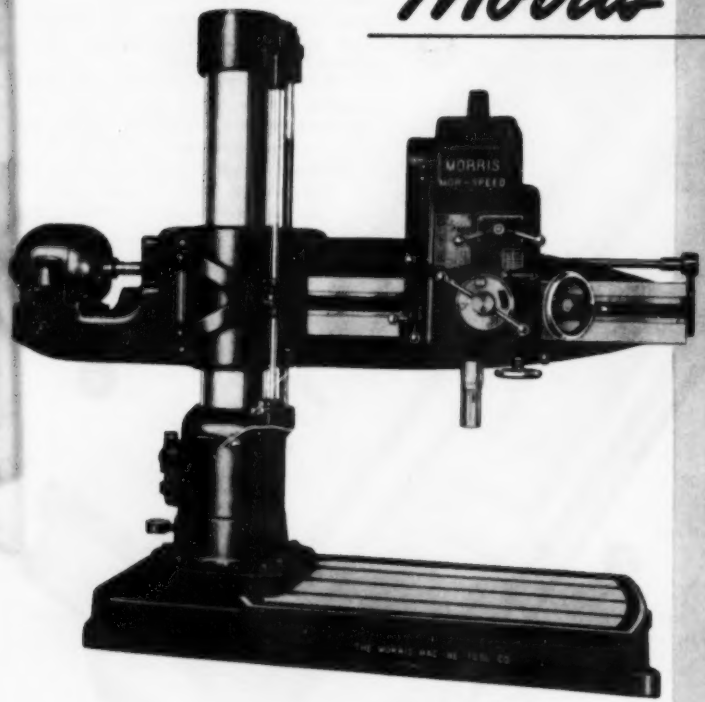

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

No Room for Complacency

The British are catching up on us. This is partly the result of visits of Productivity Teams from various industries to this country.

These teams came over to see what is new. And as one Britisher remarked, "It shook us out of our complacency." The visits were eye-openers.

Team members went back home determined to mend their ways. They made detailed reports in writing on what they had seen — new methods of doing things and particularly new processes of mechanization.

The written reports were supplemented by conferences held by trade associations to discuss around the table the information brought back from America and how to apply it effectively.

Individual managements thereupon went into action. The accomplishments have been far-reaching, as reports from the steel founding and drop forging industries reveal.

Blackheath Stamping Co. has increased production of some of its hammers 100% per hammer hour. The English Steel Corp. has enlarged output of hammers and other forging equipment 50%. George Morgan Ltd. has stepped up work done by its hammermen 40%.

Many other companies have achieved the same benefits. These achievements are not confined to steel founding and drop forging. They penetrate many other segments of Britain's metalworking industries.

These gains are not traceable to installation of new production machinery alone. Other important factors enter in — better shop layouts, more efficient methods of materials handling, more rapid and better costing procedures, increased piece-rate work. A large number of indirect workers now receive an incentive bonus based on total output by the company.

Beyond these profitable changes, the American visits have sparked other new activities. One industry, for one thing, has set in motion a research and development program. Some of the research projects already undertaken have a direct bearing on productivity.

The enterprise of our British friends should not be lost upon us. We are held up to the rest of the world so continuously as a model of industrial efficiency that we easily can be lulled into a feeling of false security.

Nothing could be more harmful to our future prosperity. The same fate would befall us that was the lot of the British for many years — obsolescence in methods, equipment and ideas. Such obsolescence leads inevitably to high-cost production, high-priced products and restricted markets, all of which are poisonous to our economic well-being as a nation.

Despite our much-vaunted success, we are nowhere near achieving the productivity of which we are capable. Up to now we have just scratched the surface. This is true of Metalworking as a whole and of individual companies.

If you are inclined to sit back and enjoy thinking about how good your shop is, you might better use your time figuring what further improvements you can make in it. That's what the British are doing.

There should be no room in our thinking and in our actions for complacency if we wish to keep our industrial leadership.

Burnham Finney

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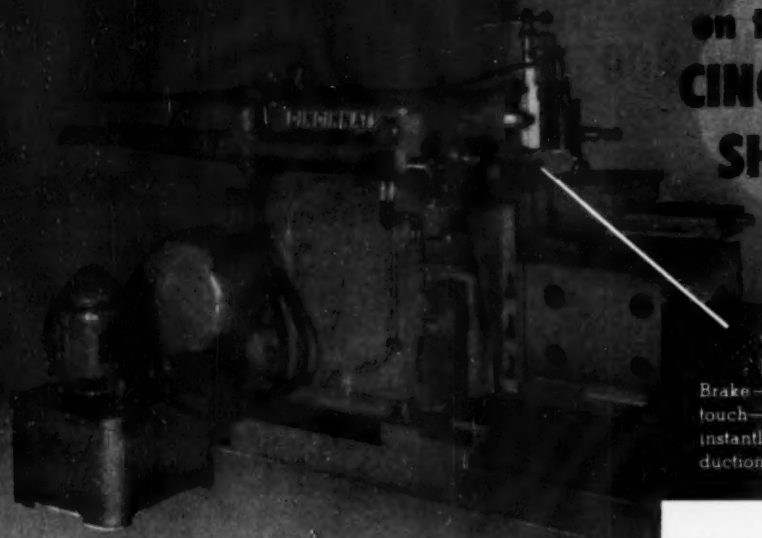
on the *same* CINCINNATI SHAPER



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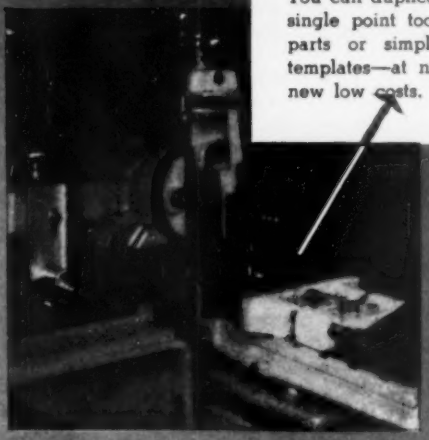

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CERAMICS SHIELD STAINLESS FOR JETS

About three years ago the National Bureau of Standards made the first of a new series of high-temperature ceramic coatings available for commercial applications. Since then, Stewart-Warner's South Wind Division has experimented with methods of applying several coatings, particularly in jet-engine components. Some results: Double metal life at jet heats when coated properly, minimum intergranular corrosion of some alloys at 1600 to 2100F, and proof that coat thickness should range around 0.001 to 0.003 in.

BY ROBERT G HICKS, Project Engineer, STEWART-WARNER CORP.

THE spur toward ceramic coatings is the shortage of heat-resisting alloy elements like nickel, cobalt, and columbium. These materials make operation of jet engines at high temperatures possible. To conserve them, the aim is to coat them with ceramic materials that resist heat, allowing weaker alloys to be used in the metal being protected.

Four coatings have been studied to establish techniques of applying the heat-resisting films. These are A-19, A-417, A-418, and A-520 (National Bureau of Standards Code).

A-417 has been applied to several thousand gas-to-air heat exchangers for aircraft de-icing systems. It is possible, as indicated by field results, to extend the life of the Inconel parts as much as 100% when treated with the coating. This material has a high thermal-shock resistance, allowing a coated part to be heated to incandescence and quenched in water without ruining the ceramic. Slight bending or flexing does not cause chipping or separating of the coating. On the other hand, A-19 is especially subject to chipping because of shock.

One typical use for A-417 is coating exhaust stacks and collector rings on radial gasoline engines for aircraft. Coating is applied to the rings both inside and out. Results have been good enough to prompt a large airline to send four sets of jet stacks to the plant for a complete coating job.

Metal Preparation

General rules worked out for coating ceramic materials on metals indicate that careful process control is essential. For example, pigmented lubricants cannot be applied to the metal during pressing and forming operations (before coating) because no method of cleaning will remove the pigment completely, and burn-off heat will melt the pigment into the metal surface. This interferes with good ceramic adhesion.

Spectrographic analysis of scale removed from heat-treated parts almost always shows traces of boron and sulfur, which would cause rapid scaling of the metal at firing temperatures. Thus, the coating could not be fired with decent results if any scale were present on the parent-metal part. An electric furnace, preferably with inert-atmosphere equipment, is essential, both for heat-treating the metal after forming, and for firing the ceramic after it has been applied.

Ceramics can be applied over welds, but the welding flux must not contain fluorides, for the coating will not adhere to fluoride-treated metal.

Washing or degreasing metal parts before coating is not necessary if preliminary stress-relieving and sandblasting have removed foreign matter from the surfaces. Part handling after sandblasting should be mechanical, because even a fingerprint will leave enough oil on the work surface to prevent coat adhesion.

Coating Process

There are five steps to applying the ceramic coat. Stresses are relieved in a continuous conveyor furnace. Low-alloy and cold-rolled steel to be coated with A-19 are held at 1200F for around 2 min. High-temperature alloys are held at 1500 to 1800F for 5 min. This burns off grease and dirt, and oxidizes the surfaces slightly. Oxidation is, in this case, an advantage because, when it is removed by sandblasting, it proves the surfaces are clean.

Next, a coarse sand is blasted onto the parts. Metal shot or grit are not applicable because they may contaminate the parts. Cold-rolled parts may be acid-pickled instead. Either process cleans and roughens the surface slightly, which improves holding qualities.

The coating is applied by dipping or spraying, depending on the character of the metal surfaces. Sometimes special fixtures are necessary to insure full coverage at the exact thickness re-

quired. The slip (powdered frit, clay, and water) is applied to a thickness of 0.002 in., with a tolerance of 0.0005 in. Too thick a coat will tend to crack and flake, while a thin one will not provide insulating properties.

Applying the slip is similar to enameling, so similar methods are used to check quality. Sample panels can be weighed, coated, and weighed again to determine the coat thickness.

The fourth step is drying the slip coat with heated air, then wiping off any surfaces or edges that are to be left uncoated or are later to be machined or welded.

Last, the coat is fired in an electrical box furnace. Firing temperatures are established for the different coating materials (See table). Length of time in the furnace, after firing temperature is attained, depends on the thickness of the coat, configuration of the parts, and size of the load. For a load of 150 lb, total furnace time might run as high as 30 min.

If the coating is not adequate, parts treated with A-19, A-417, or A-419 can be patched and refired. If no repairs can be made, stripping is done by immersing the part in hydrochloric acid for six to eight hrs, then sandblasting. The part is heated to about 1500F to stop acid action, and is sandblasted again.

NATIONAL BUREAU OF STANDARDS CERAMIC COATINGS

APPROXIMATE MELTED COMPOSITION

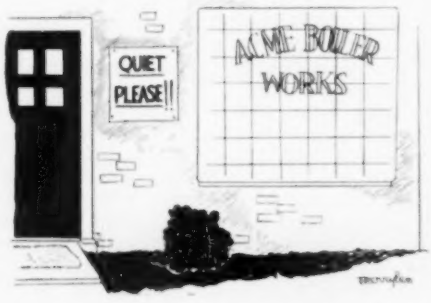
COATING → OXIDE	A-79 %	A-417 %	A-520 %
Al_2O_3	23.24	1.93	2.25
SiO_2	39.0	27.66	35.21
B_2O_3	13.68	4.37	5.56
Na_2O	11.94	—	—
K_2O	3.51	—	—
CaO	4.42	2.69	3.43
BaO	—	29.51	37.61
ZnO	—	3.35	4.29
BeO	—	1.68	2.15
CoO	1.24	—	—
NiO	0.46	—	—
MnO_2	1.01	—	—
Cr_2O_3	—	28.81	—
CuO	—	—	9.5
F_2	1.52	—	—
Total	100.00	100.00	100.00

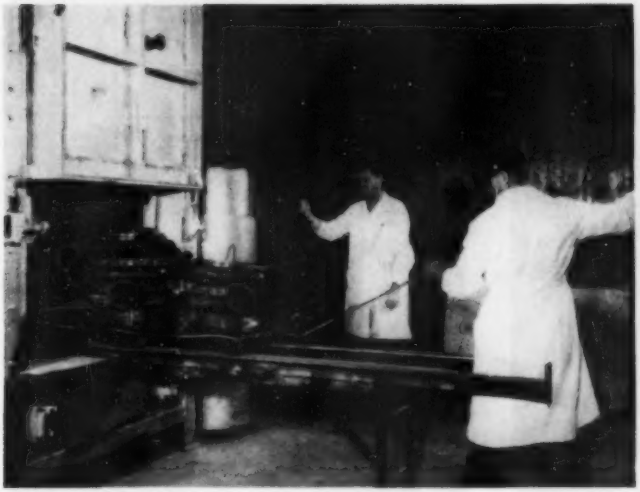
Note: Above compositions include all mill additions to basic frit.

NATIONAL BUREAU OF STANDARDS CERAMIC COATINGS

CHARACTERISTICS AND TYPICAL APPLICATIONS

COATING	FIRING TEMP	GENERAL CHARACTERISTICS AND APPLICATIONS
A-19	1650 F	Developed during World War II, this cobalt-nickel composition consists principally of 50 parts relatively soft fusible frit, 50 parts hard frit, 25 parts calcined alumina, 10 parts enameler's clay, and traces of other ingredients. Fired coat is brittle and will not stand much shock or flexing without chipping, so should be applied after part is completed. It cannot be used at temperatures much above firing heat, except for short exposures. Tends to flow off surfaces attacked by high velocity, high temperature (1700 F and up) gases. Can be applied to cold-rolled steels, low-alloy steels, types 302 and 304 stainless steels, and Inconel, and Multimet N155. Composed of 70 parts high-barium, alkali-free (NBS No. 331) frit, 30 parts chromic oxide, and about 5 parts enameler's clay, this high-temperature ceramic coating is better suited for most applications than A-19. It has more impact resistance and higher flexibility, and can be exposed to temperatures in the 1900 to 2100 F range (200 to 300 F above firing temperature). Service experience proves its ability to extend the life of high-temperature alloys. In the 1,800-to-1,900 F range, life of some parts is increased 50 to 100% over that of uncoated parts. It will not adhere well to types 302 and 304 stainless steels, but can be used to coat parts made from types 310, 321 and 347 stainless, all high-nickel alloys, Inconel, and Multimet N155. Its high firing temperature makes it unsuitable for low-carbon steels and for alloys with low oxidation resistance. A-19 is easier to apply, so is often selected when high impact resistance is not needed and operating temperatures are on the low side of the high-temperature scale.
A-418	1850 F	Virtually the same coating as A-417, but made with frit free of beryllium oxide. Has about the same physical characteristics as A-417.
A-520	1750 F	Less brittle than A-19, but not so flexible as A-417, this coating has the same frit as A-417 but uses 10% copper oxide and 90% frit. The firing temperature of this coating is intermediate and no applications have been found for it at the present time.





Ceramic-coated aircraft-engine parts are coming out of gas-fired furnace after having been baked at 1700 F. Completed piece (turbosupercharger nozzle box) and fixture that supports piece during firing are shown at right.

All fixtures and supporting plate on work-carrying table are coated with the same ceramic as is applied to nozzle boxes. Fixtures are 321 stainless; furnace is gas-fired, non-muffled unit rated at 2300 F maximum

CERAMICS MAKE FURNACE FIXTURES LAST LONGER

Temperature-resistant coatings extend fixture life 4 to 5 times at Solar Aircraft Company

D K KROSCH, Superintendent, Solaramic Department, SOLAR AIRCRAFT COMPANY, San Diego, Calif

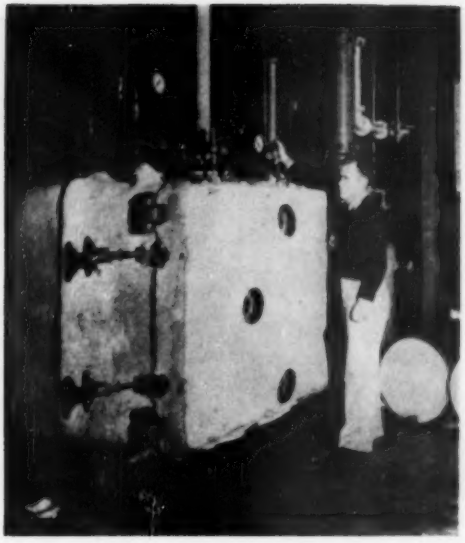
Just as ceramic coatings extend the service life of jet-engine parts operating at high temperature, so too are they now being applied by Solar Aircraft Company to lengthen the life of fixtures in high-temperature firing and heat-treating furnaces. Solar-developed coatings are thin, approximately 0.002 in. being the usual thickness, and can be applied over welds. While a sharp blow may fracture the coating at the impact area, a thin film will remain to protect the metal.

Major steps in the ceramic-coating process are similar to those of porcelain enameling. The ceramic materials are mixed, melted, and poured into cold water. The molten material, which is similar to glass, shatters in the water to form a frit. The frit is a ball milled with water, binder, and other materials, and is ground. This substance then is sprayed on the work, dried, and fired in a furnace in which the atmosphere is slightly oxidizing.

As firing is performed at temperatures as high as 1800 F, oven fixtures required in the production of ceramic-coated parts initially burned out in a relatively short time. To lick this problem, Solar applies a heat-resistant ceramic coating directly to the fixtures themselves. Once applied, the coating withstands temperatures higher than that at which it was fired without losing its protective properties. As a result, the service life of fixtures has been increased four to five times. Fixtures used regularly in the ceramics department require coating approximately once every three months.

The success of the coatings in the ceramics department has led Solar to apply them to fixtures employed in heat-treat operations. While they have not been in use for a sufficiently long time to permit an accurate evaluation, the ceramic coatings also show promise of giving appreciably increased life in this application.

High-vacuum impregnation assures thorough, deep dispersal of the impregnating material. Here, small metal parts are infiltrated with plastic resin. After filling, chamber is sealed and evacuated. Then basket of parts is lowered into pool of resin



High-vacuum furnace provides inert atmosphere for sintering, heat-treating, brazing, and melting materials such as magnesium and titanium without permitting oxidation. First, air is removed, then inert gas is introduced

HOW HIGH VACUUM AIDS

In recent years, more and more shop operations require inert atmospheres, degassed materials, or other conditions that once were only laboratory possibilities. Here is how modern equipment makes high vacuum a practical production tool

BY FRANK CHARITY, Los Angeles 32, Calif.

VACUUM-OPERATED equipment is not new—until one is told that the absolute pressure is one micron, or 0.00002 psi. Don't be surprised if you hear about a lot of new techniques with this equipment, or even if you find there's a potential application in your own processes. Development is new and versatile.

Most plants have compressors which serve as vacuum pumps in reducing pressures to about 29 in. of mercury, but that limit is now regarded as "low vacuum." It is satisfactory for such things as floor cleaning and degassing *some* castings, but it is far from adequate where processing requirements call for a minimum of air to prevent oxidation, increase wetting action, or provide a similar condition.

Only one inch of mercury makes the difference, but the jump is tremendous—both in equipment and technique. High vacuum is found in the 29- to 30-in. range, 30 in. being a perfect void. Nobody, yet, has been able to scavenge every last molecule of air to form a *perfect* vacuum, but recently developed vacuum pumps can reduce pressure to less tahn 1 micron, without an exhorbitant investment in time and equipment. And this is important to:

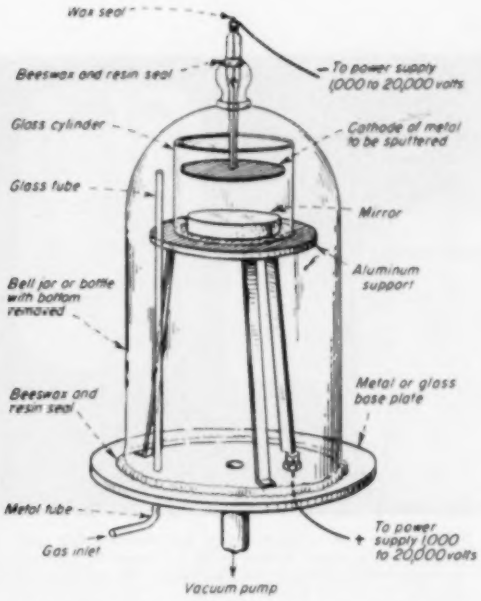
1. Create an inert atmosphere for sintering, heat-treating, brazing, or melting materials such as magnesium and titanium, without oxidation or combustion.

2. Impregnate or seal a metal casting, armature, coil, condenser, or similar component.

3. Package a perishable product in an airtight container to prevent any deterioration over a long period of time.

4. Apply, without oxidation or roughness, a pure

Vacuum forming is done with a porous or perforated plaster or metal mold. Heat-softened sheet plastic is clamped with a "draw-ring" over the mold cavity and forms to the mold-shape as air is withdrawn from the cavity



Laboratory cathode-sputtering device is similar to production units used to metallize non-metallic patterns prior to electroforming molds. Method is also used to selenium-coat plates and disks for rectifiers

METALWORKING

metallic coating with dimensionally precise thickness ranging upward from one millionth of an inch, on either metallic or non-metallic surfaces.

To create an inert atmosphere, the vacuum chamber is usually an airtight electric furnace, as gas-fired burners would require separate compartments to supply the necessary oxygen without contaminating the atmosphere. After the furnace is loaded and closed, air is withdrawn with a high-vacuum pump and an inert gas such as argon or helium is introduced. Heavier-than-air inert gases are usually preferred because they will cause air remaining in the compartment to rise above the material being heated.

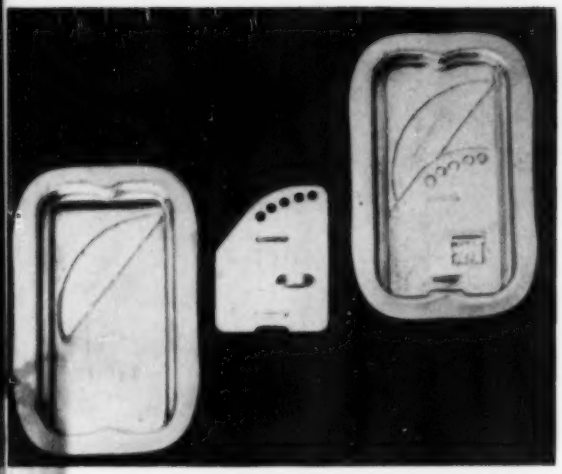
For high-vacuum impregnating without heat, the chamber is evacuated as above, then a pipe leading to a tank of liquid impregnant is opened. The workpieces are submerged in the impregnating material and, as the pores are air free, wetting action is excellent. For more thorough infiltration, the vacuum is released and the air pressure in the chamber is increased above atmospheric. Preservatives can also be applied in this manner, thus improving protective qualities.

Vacuum packaging is also done in a chamber, but in this instance a mechanism is included in the chamber to seal the containers as soon as all of the air is withdrawn.

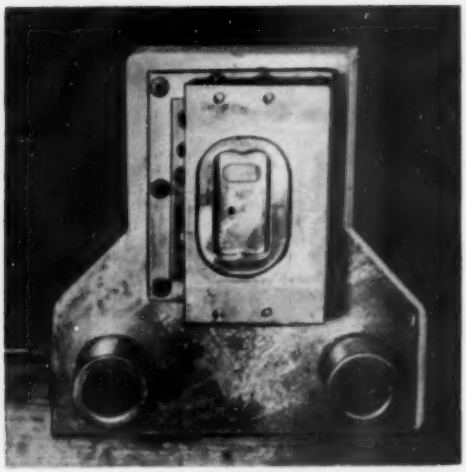
High-vacuum coating includes cathode sputtering and metal evaporation. Again, air is evacuated and an inert gas is substituted for it to prevent oxidation of coating materials.

Coatings of selenium, tungsten, aluminum, and many other elements and alloys can be uniformly produced by cathode sputtering. High-voltage current is applied to two or more electrodes arranged to form an electrical spark gap. Current passing between the electrodes causes each cathode element to sputter or disintegrate, thus depositing metallic particles on the surface beneath the electrodes.

In the evaporation process, high-amperage electricity heat-vaporizes the metal coating material so the metallic vapors are deposited on metallic or non-metallic deposition surfaces. No heat is conveyed to these surfaces, as particles are of molecular size, hence chill rapidly. Smooth, uniform coatings as thin as 0.000001 in. are readily built up with extreme accuracy by limiting the period of vaporization. Extremely thin coatings are transparent and are used for such things as minimizing reflection within lenses to increase light-transmitting qualities (coated lenses).



Spicecan cover has teaspoon opening and pierced sliding cover. Flange width is critical because cover is crimped to spice can, must seal completely. Compound die produces 150 covers per min



Cover die is built on a Danly dieset. First, spoon-entry piercing punch and character stamp, "sifter spoon," are placed in position. Next, drawing punch and blank retainer are added. Upper die con-

COMPOUND DIES *blank, pierce, and form*

Glen Pfister, president of A-G Tool & Engineering Co, Cincinnati (a member of the National Tool & Die Manufacturers Association), had to prove a point: HSS compound dies in high-speed presses are more practical than simple carbon-steel dies in kick presses. His first dies were on a "pay us if they work" basis. They did, and the customer has now retooled the plant; increased production many times

I asked Glen, "Why use a compound die when a progressive is cheaper?"

And the answer was clear—the tinplate to be worked is available only in sheets which must be sheared into short strips. Also, a compound die eliminates movement between stations and the tolerances are very close. Parts must be free of burrs and the flange width dimensions are exact.

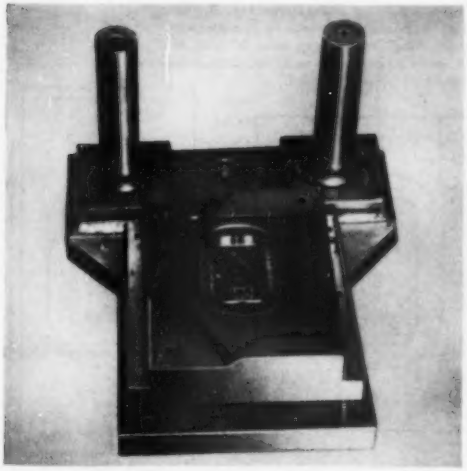
The part being made is a "sifter spoon" cover for a spice box. This device is later crimped to a metal box and will admit a teaspoon, as well as provide a shaker top, for pepper and other spices. Two parts comprise the unit: the cover itself, and the dredge, or slide, used to close the openings. Both parts are assembled to close limits as the slide must have a snug but free movement. It cannot be permitted to slip open accidentally, yet must not be prevented from moving readily under finger pressure.

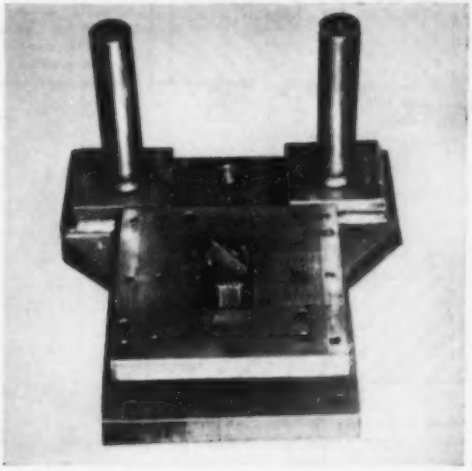
For both pieces, the material is 80-lb tinplate, 0.010 in. thick, received in sheets about 4 x 8 ft. A special machine automatically shears these sheets into strips and stacks them for easier handling.

Each of the two parts requires a separate die, and each die includes some unique pressworking tricks. Both parts are made on 28-ton Bliss, double-action presses inclined to 60° from vertical and equipped with air blast to aid ejection. The short strips are fed by means of an automatic vacuum-feed attachment provided on the presses by the builder.

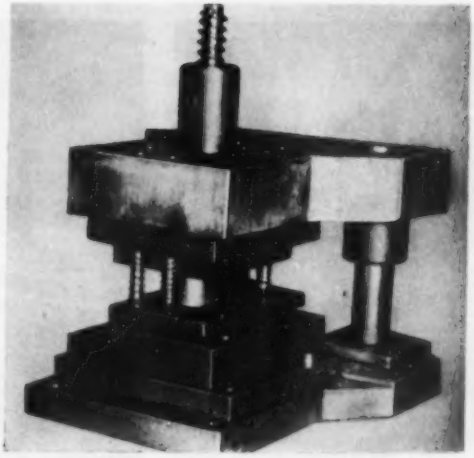
For the cover die, a Danly dieset supports the dies, made of Carpenter 610 steel. At each of the press strokes (135 per min) these operations occur to complete one cover:

1. Strip feeds in
2. Blank cover
3. Draw and form
4. Stamp characters
5. Pierce spoon entry — rubber bumper presses slug back into hole
6. Eject



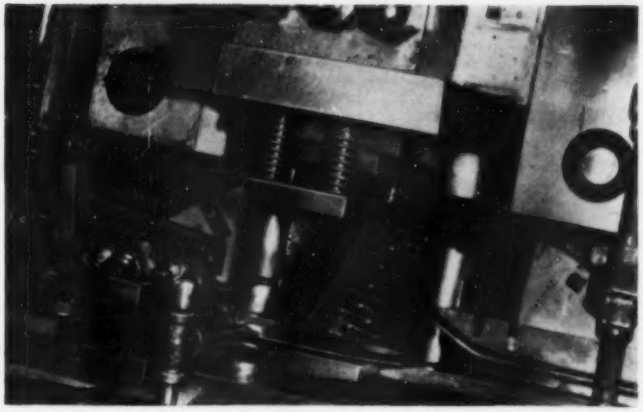


tains draw ring and rubber pad to reset entry slug. Part is formed into this die, then ejected with a positive knockout. Blanking is done by this portion of the tool prior to forming



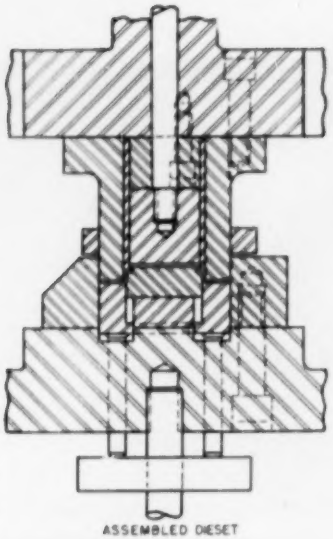
multiple parts

BY W. M. STOCKER, JR., ASSOCIATE EDITOR



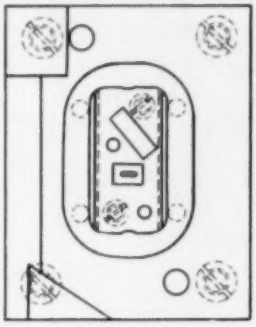
Die is set up on press inclined to 60° from vertical, but efficient ejection requires supplementary air pressure. Stock strip is fed from left to right by means of an automatic vacuum feed. Parts are blanked and formed without marring the tin plate

PLEASE TURN PAGE



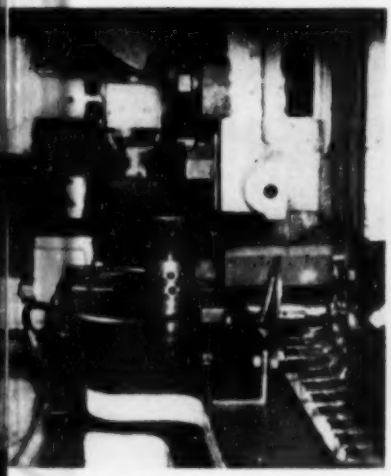
ASSEMBLED DIESET

Die design for cover is comparatively simple. Components are arranged in sections for easy adjustment after sharpening. Punches operate from bottom die, with rubber bumper and mechanical ejector in upper die. High-carbon, high-chrome steel is used for draw ring and die block, while oil-hardening tool steel is used for working components of die



BOTTOM DIE

UPPER DIE



Press setup for dredges operates at 150 strokes per min; produces 4 pieces per stroke. Scrap strip passes out of right side of machine and into barrel

Vacuum sheet feed is fully automatic attachment provided as extra equipment. Feed is cam actuated and timed with the press cycle. Press stops when stock runs out

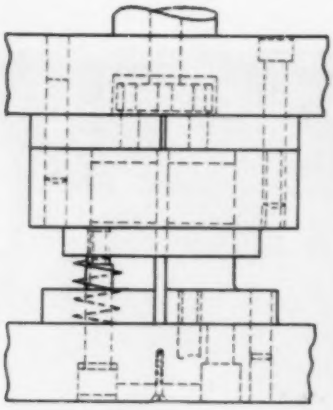
Blank strip for dredge is 22 in. lg x 3 in. wide, 80-lb tinplate, 0.010 in. thick. Die produces 4 pc per stroke. Freedom from burrs is particularly important

Die construction is sectional to permit easy repair and resharpening. Forming is done upward and, by placing a rubber pad in the die, the piercing punch removes the spoon-entry piece and stamps in the "punch in" instructions simultaneously. As the punch retracts, the rubber bumper forces the slug back into its original location.

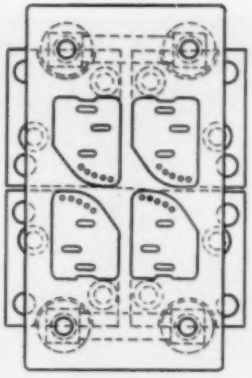
Thus, the eventual purchaser of spice can readily remove the spoon-entry closure. At present, the die produces only one cover per stroke, but a new die is being planned to produce from two to four covers per stroke.

Production of the dredge, or slide, is now at the rate of 150 strokes per min and four pieces per stroke, or 600 dredges per min. This die is an excellent example of multiple-compound stamping. It, too, is sectional, and the four units are arranged to evenly distribute the pressure over the die face. The piece is carried and worked in the upper member of the die and, finally, is ejected from the top by the use of a positive knockout. The bottom die is nothing more than a rubber pad and draw ring.

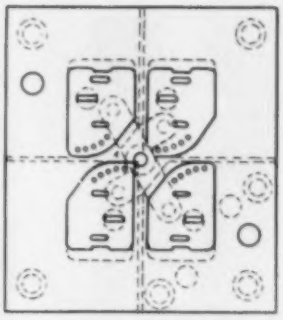
Movement of the slide after assembly is done by hooking a small U-shaped projection with a spoon or fingernail. The lancing punch used to form this projection is sharp on the sides but radiused on the ends. Thus, it slits the two sides and draws out the projection without breaking the ends. Some experimenting was required to de-



ASSEMBLED DIESET

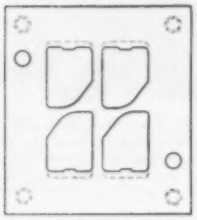


BOTTOM DIE

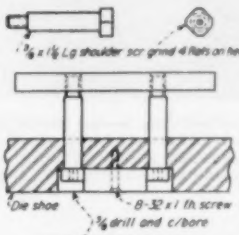


UPPER DIE

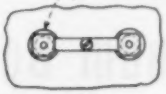
Dredge die is mounted on a Lemco precision die-set, and used on a 28-ton Bliss double-action inclinable press. Shaker holes are pierced with 0.076-in. dia × 1⅛-in. lg HSS punches held in place with staggered socket-head setscrews. Handle for spoon-tip or fingernail is produced by sharpening sides of punch but not ends, so sides are slit and drawn up



PUNCH HOLDER

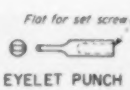


USE TEMPLET TO LAYOUT CURVES AND RADIUS

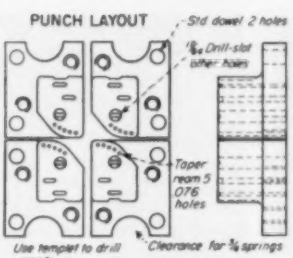


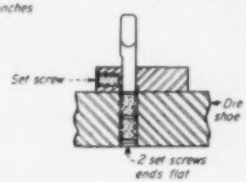
Stripper-screw lock adjustment

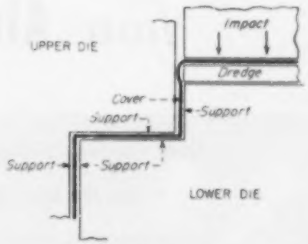
.076" holes close fit on punches



EYELET PUNCH


PUNCH LAYOUT
Std dowel 2 holes
Drill-slot idler holes
Taper ream 5 .076 holes
Use templet to drill .076" holes
Clearance for ⅛ springs





Assembly tool principle is to hold firmly all surfaces of the parts except the sides, then strike the top. Sides collapse evenly to provide enough pressure to grip dredge firmly but do not allow sloppy fit

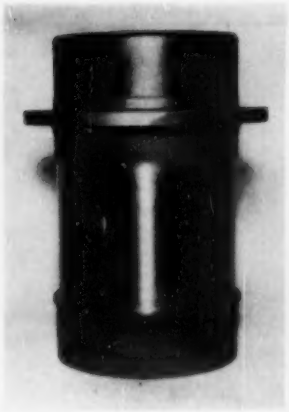
termine the amount of draw which could be obtained without tearing out the piece.

This die, too, completes the piece in six virtually simultaneous steps:

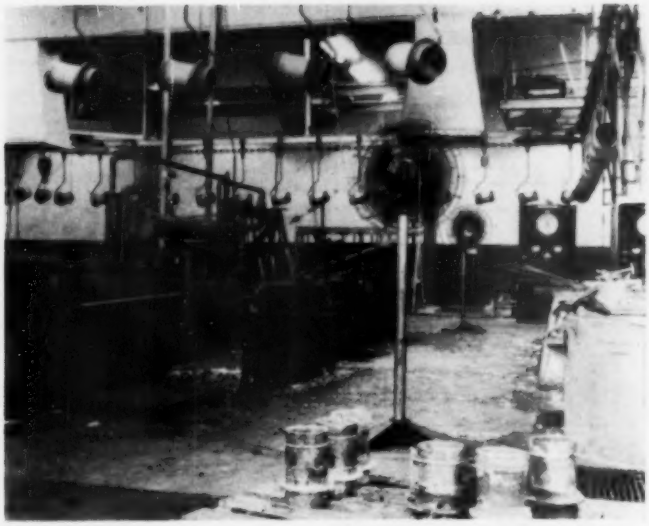
1. Strip feeds in
2. Pierce small holes
3. Blank dredge
4. Lance projection
5. Emboss
6. Eject

Assembly is still done on a kick press with a simple die, but this, too, may be automatized because it is the present bottleneck, requiring eight presses to keep up with the new dies. However, the technique is tricky. First, a dredge is placed on the bottom die, then a cover is placed over the dredge. As the upper die comes down, every surface of the cover is supported except the sidewalls, hence these are bulged by the die impact and the dredge is locked in place. Striking pressure and support had to be carefully calculated to provide exactly the right grip on the dredge to insure locking without crushing or binding.

As a result of this tool-improvement program, the spice manufacturer has considerably enlarged his production program. It has started a company-wide trend toward automatic manufacture in all phases of operation. In addition to increased output in less space, the cost reduction effected by improved methods was far greater than had been anticipated. And the die-maker started it all!



Cylinder-barrel forging is rough turned, heat-treated, brinelled; the area to be bonded with aluminum is degreased and sandblasted, then areas other than the bond area are graphited to prevent bonding. Barrel OD is ground to ± 0.010 in. dia to eliminate tool marks and oxidation pockets which would spoil bond



Overhead chain conveyor interconnects all process steps: graphite, bake, bond, cast, quench. Another conveyor provides transport to and from the machining operations. Bond and cast furnaces are on the right, carting molds in the center, and quench tank at the left. Bonded cylinder barrels must be put immediately into the permanent molds for casting the muff

how Aluminum Bonding is Keyed to

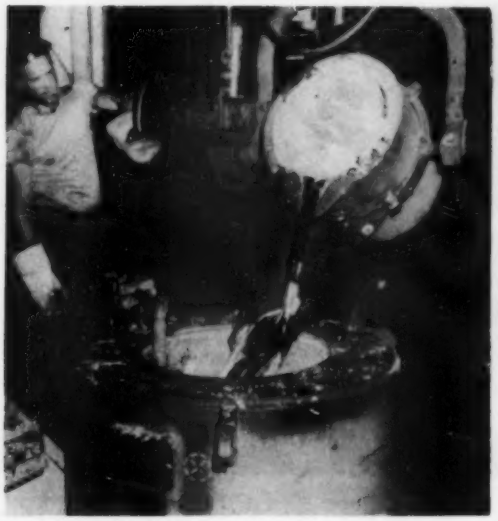
Many engineers believe that the bonding of aluminum to steel is strictly a foundry operation. Here is how Continental Motors Corp designed the process into its cylinder-head production line. Aluminum increases heat radiation at reduced weight nd permits faster machining rates

For years, the bonding of aluminum and aluminum alloys to steel has been considered a mysterious and highly complicated process. Actually, it is very simple. The steel surface to be coated is machined and cleaned, then the steel is placed in molten aluminum to be "tinned"—which actually creates a surface of iron-aluminum alloy. After this, the part is placed in a mold and molten aluminum is poured around it. When this material hardens, the part is ready to machine.

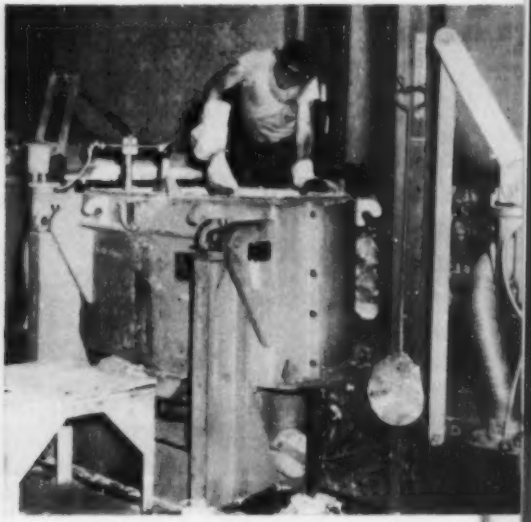
At Continental, cylinder barrels are being made for two tank engines, the heavy 825-hp AV 17905B and the smaller supercharged 525-hp AV 895. Both engines are air-cooled, utilizing cylinders with a muff of aluminum which is finned to radiate engine heat.

One of the problems in setting-up was to include the Al-Fin bonding and casting process in the machining line. As the part required machining both before and after bonding, the logical place for this operation was adjacent to the machining operations. This unusual requirement turned out to be extremely practical. In addition to easier handling and higher production, quality was improved and output was geared directly to line demands.

Cylinders are received as forging, are rough-turned, heat-treated and shotblasted. Then the area to be bonded is degreased, sandblasted, and degreased again. Just before bonding, colloidal graphite is brushed onto those portions of the forging which are *not* to receive aluminum. The graphite is dried in an infra-red oven; it provides a mask against bonding graphited areas when the piece is immersed in the molten aluminum.



Five induction furnaces keep the metal molten. Two furnaces are for bonding, two for casting, and one standby. Each furnace has a 400-lb load of aluminum and is filled, with the bull bucket shown, from a larger melting furnace. Hinged gutter directs metal into furnace; prevents aeration of the aluminum

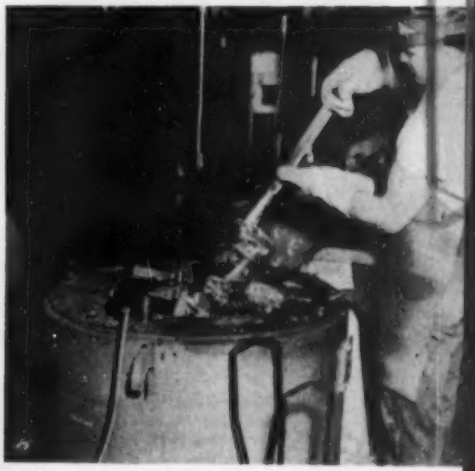


Four Ajax 100-kw melting furnaces hold 900 lb of aluminum each and, together, supply 1000 lb per hr. By electronic control, furnace maintains temperature constantly and automatically

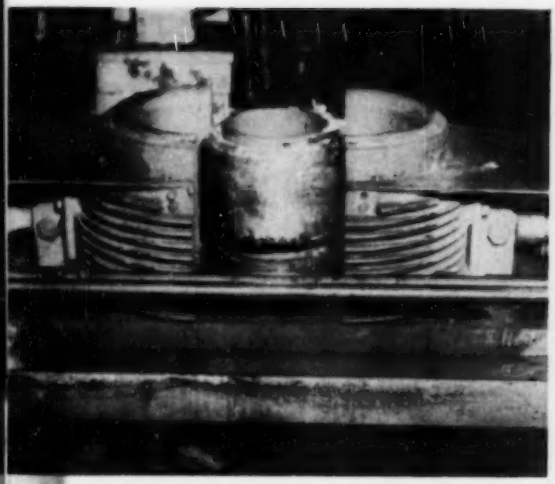
Production

BY WILLIAM M STOCKER, Jr, ASSOCIATE EDITOR

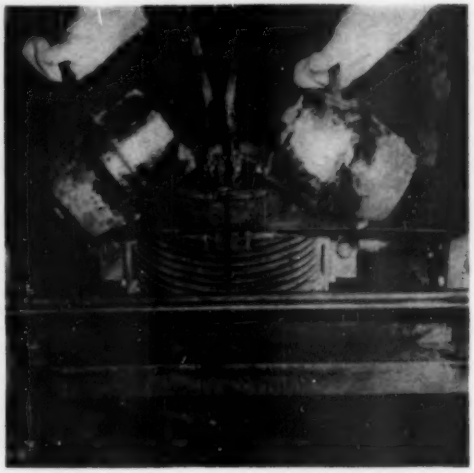
Bull bucket is carried on separate overhead conveyor to fill working furnaces from melting furnace



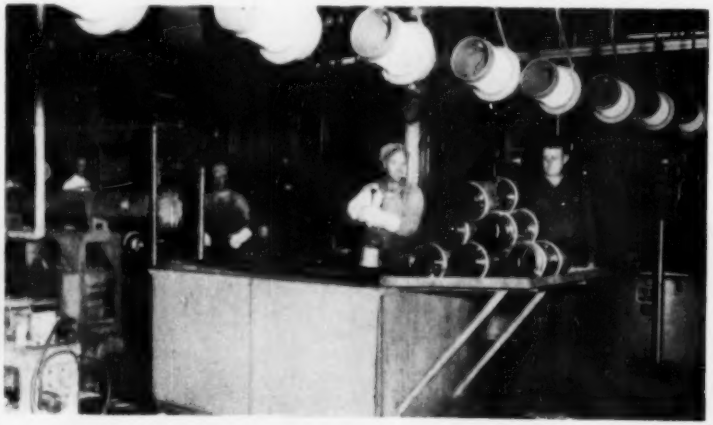
Bonding is done by agitating cylinder in molten aluminum for 3 min. Hook holds cylinder and an overhead cam provides agitation. Automatic timer flashes green light while bonding and red light when finished. Steel loses only 2 points on R_c hardness scale during bonding, is R_c 28-32



Pneumatically operated permanent mold was built by Huckins Tool & Die Inc, South Bend, Ind. Cylinder barrel is placed in center with mold split, then air cylinders close mold and hold firmly for pouring

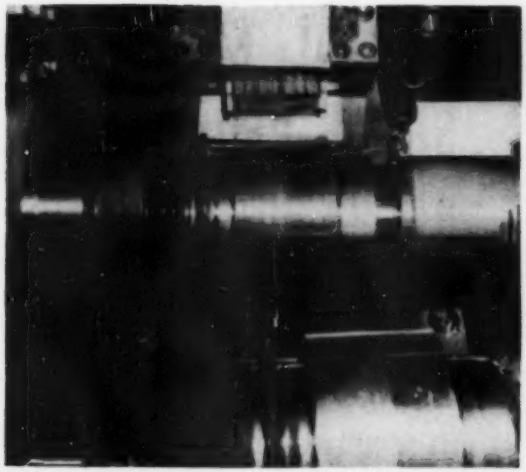


Casting of the muff is done with two ladles to provide more even and rapid bonding. Metal is simply poured into the permanent mold and bonds instantly to the aluminum "tinning" band

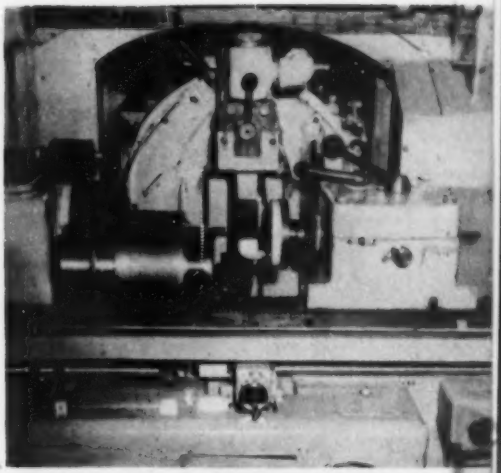


Quenching occurs immediately after molten aluminum hardens. Quenching oil is refrigerated to remove heat built up during constant production use. Large blowers overhead and circulating fans on the floor maintain efficient working temperature level for workmen

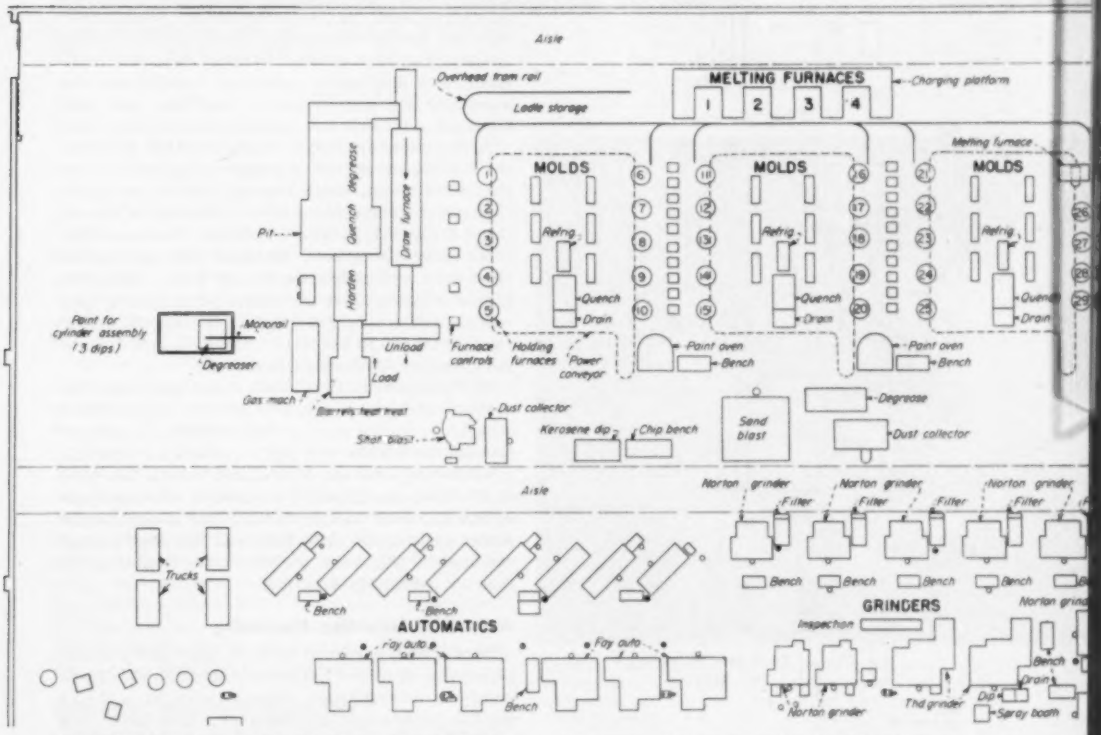
Cylinder barrel after casting (right) and completed (left). After casting, muff is rough-turned to clean up and remove unwanted portions. Area where cylinder is threaded for head was graphited so that muff would not bond, could be cut with parting tool and removed as a ring by means of a hydraulic press



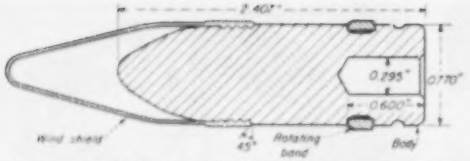
Finning is performed on a 20-in. Fay automatic using a gang tool to produce 38 fins in one pass. Fins are 0.038 to 0.048 in. thick, space is 0.0735 in. wide and 1 in. deep. Bottom fin is thicker because it is more subject to damage and would bend during finning if thin. Gang tool is inverted for cutting, and wide coolant nozzle sprays curtain of fluid through tool spaces to cutting edges



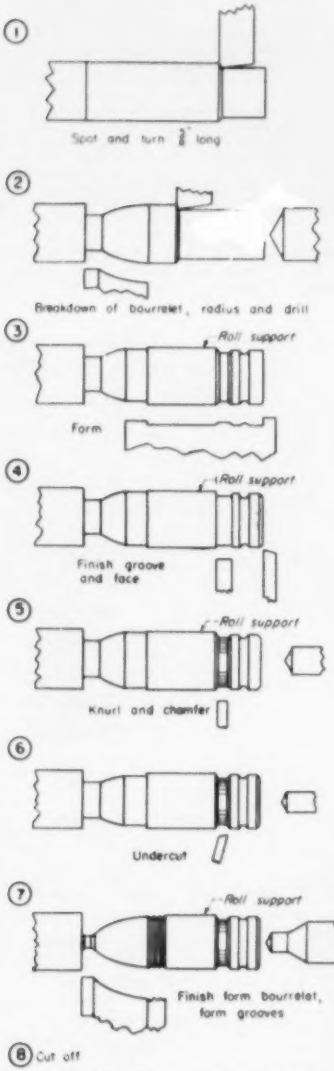
Buttress-style thread for cylinder head is ground on barrel, using a multiple-ribbed wheel on a Jones & Lamson thread grinder. Wheel is crush dressed



Bonding-line layout is a compact unit adjacent to machining line needed in the process. Melting furnaces and ladle storage in the upper area are used to feed fresh, clean molten metal to the working furnaces which are grouped with molds and quench tank to minimize handling. After quenching, barrels move across aisle to machines for finning and thread grinding



Armor-piercing shot has SAE 4150 steel body, gilding-metal rotating band and drawn sheet-steel windshield



Conomatic tooling layout for rough-machining shot body. Cycle runs about 15 secs per piece with HSS tools and spindle speeds ranging from 580 to 640 rpm

SPECIAL SETUPS SPEED PRODUCTION OF 20-mm AP SHOT

Current high production requirements demand innovations. Induction hardening and black-light inspection, as well as many machining operations, are automatic

BY FREDERICK N BEEDE, General Superintendent
PANTEX MANUFACTURING CORP, Pawtucket, R. I.

ALTHOUGH production of 20-mm AP shot is based on conventional operations at Pantex Manufacturing Corp; special setups have been devised to increase and maintain high production rates. Induction hardening and Magnaflux inspection installations are automatic and many standard machines have been modified to provide fast, special-purpose operations.

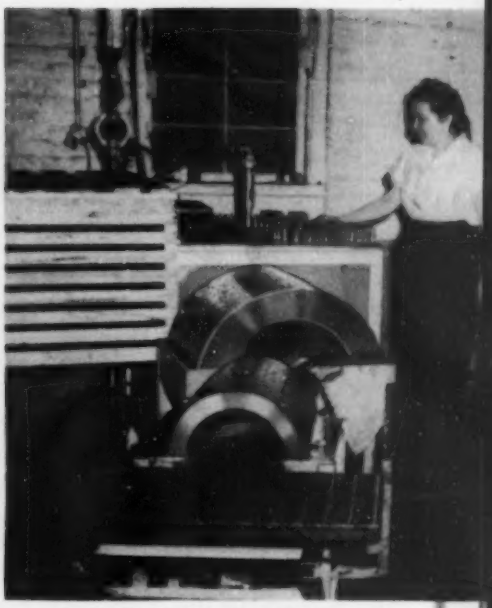
Armor-piercing shot is made of SAE 4150 bar stock 27/32 in. in dia. Sequence of operations begins with rough machining in 1⅝-in., 8-spindle Conomatic bar machines where the work is turned, formed, grooved, knurled and drilled. Tools are HSS; after conventional heat treatment they are further treated in a nitriding liquid salt bath, (Houghton Liquid Heat No. 720) to provide an extremely hard surface and a resulting longer life. Spindle speeds range from 580 to 640 rpm. Coolant is 1-20 Houghton's Antisep All Purpose Base.

Production cycle runs about 15 sec per piece. Operations include knurling a groove to provide a seat for a rotating band assembled later. A series of grooves toward the nose end, on which a windshield is afterward secured, is produced with a flat form tool. Finish machining shot noses is done in Sunstrand Rigidmils at a production rate of six to eight pieces per minute. HSS tools and the same coolant are used for this work, the tools being treated in the manner previously described.

Automatic Induction Hardening

Shot is then hardened to R. 62, later being stress-relieved so that final hardness is about R. 57. Hardening is accomplished automatically in a Lepel machine with a specially designed rotary table. This carries shot through coils where they are heated to 1850 F from the nose end back to about ½ in. from the base. After shot passes through the coils, a

Finish-machining body noses at a rate of six to eight pieces per minute in a Sundstrand Rigidmil



Special induction hardening setup where work is carried on a rotating table to heating coils then ejected into water quench drum. Second drum applies rust preventive

stationary cam track wipes them from nests in the table so they drop into a rotary quenching drum.

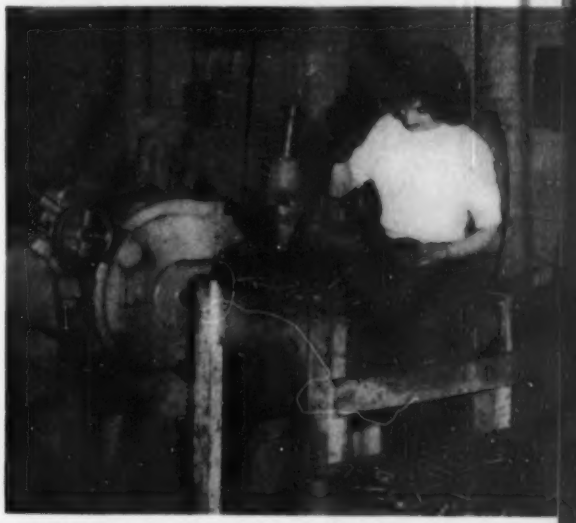
Water at 80 F is swirled about in this barrel to prevent formation of steam pockets. Result is a uniform quench. A revolving screw carries the work from the quench barrel to another drum in alignment with it where a rust preventive is applied. Heat-treating cycle is approximately eight shot per minute. Stress-relieving follows in a Gehnrich electric oven for 3½ hr at 350 F.

Before proceeding further, samples are sent to Aberdeen Proving Grounds for ballistics tests. When approval has been received, further production operations are carried out.

Hardened shot then have body diameters ground. Cincinnati centerless grinders are arranged in tandem setups for rough and finish grinding. Work is gravity-fed to the first machine from an angle-iron track. About 0.006 in. of stock is removed in rough grinding, after which shot is carried by means of a small belt conveyor to the second machine for finish grinding, where 0.003 in. of stock is removed. Antisep soluble-oil coolant is used in 1-40 ratio. Tolerances of 0.001 in. are held and production rate amounts to 2800 pieces per hour.

Automatic Magnaglo Inspection

After grinding, 100% Magnaglo inspection is made. This is done automatically in a specially developed rotating drum which carries the shot to a magnetiz-



Loading feed track to one centerless grinder in tandem arrangement with another. First machine rough grinds body dias, and belt conveyor carries work to second for finish grinding

PLEASE TURN PAGE

Automatic Magnaglo inspection has indexing drum that carries work to magnetizing coil. Air piston ejects shot from drum into track where fluorescent penetrant is applied. Track then carries work to black light, demagnetizing coil, and alkali wash

Oster turret lathe modified for trimming rotating bands at 800 pieces an hour. Work is loaded in air chuck by cam action to hold length dimension. After trimming, a spring ejector in the chuck shoots the work into a track to an inspector at the machine

ing coil. Eight equally spaced cylinders in the drum can each accommodate three pieces. Shells are loaded in a feed track aligned at the top of the hole circle of the cylinders and are pushed against a positive stop so three enter each cylinder as the drum indexes.

After passing the magnetizing coil, an air piston at the bottom of the hole circle unloads each cylinder, three pieces at a time, into a track in alignment on the opposite side of the drum. Shot is carried along this track to pass through a tube where it is sprayed with a fluorescent penetrant. Excess solution is removed in another tube through which the shot passes before reaching a black-light installation.

Under black light, interruptions in the magnetic field caused by defects or such variations in the structure of the shot as cracks, are highly fluorescent so that 2500 pieces per hour are accurately and thoroughly inspected. This production rate includes demagnetizing and an alkali wash through which shot passes in the same feed track after inspection.

Standard Equipment Modified

Next operation is to swage windshields on shot. This is done in a carbide ring die fed by an indexing table on a punch press at a rate of 1000 per hour. Flash is trimmed from the back end of the assembled windshields in modified Oster turret lathes. In these machines a 45° chamfer is produced on this end of the windshield by a single-point tool in the rear toolpost. A dial indicator on the same toolpost shows the degree of concentricity. Work is loaded in a fast-acting air chuck for this operation, and production rates run about 700 pieces per hour.

Back ends of the windshields are then centerless ground within a tolerance of 0.001 in. at 1800 per hour. This is followed by swaging rotating bands into the knurled groove at the rear of the shot. Tire setters give a production rate of 700 pieces per hour.

Other Oster turret lathes are specially rigged to trim these bands to fit the rifling in guns. A cam on the rear cross-slide of each machine pushes the shot in to a spring-loaded air chuck against a positive stop. This maintains the exact dimension from the end of the shell to the front of the rotating band. A single-point carbide tool on the rear toolpost is brought forward to turn the band, after which the chuck is opened and the spring ejects the work. A track, into which the shot is ejected, carries it to a bench in front of the lathe where it is immediately inspected for size and condition of the trim. About 800 pieces per hour are trimmed in each machine.

Final operations include inspection, marking the bands, phosphate coating, then automatic paint spraying in booths and conveyors. The same general procedure is followed in the manufacture of 20-mm practice shot, also produced in this plant. Practice shot, however, is made of SAE 1137 cold drawn bar stock and is fitted with a die cast nose. Advantage is taken of the special setups described above, wherever possible, so that production rates compare favorably with those for AP shot.

HOW TO BEND HIGH-STRENGTH EXTRUDED SHAPES

BY F. C. HOFFMAN
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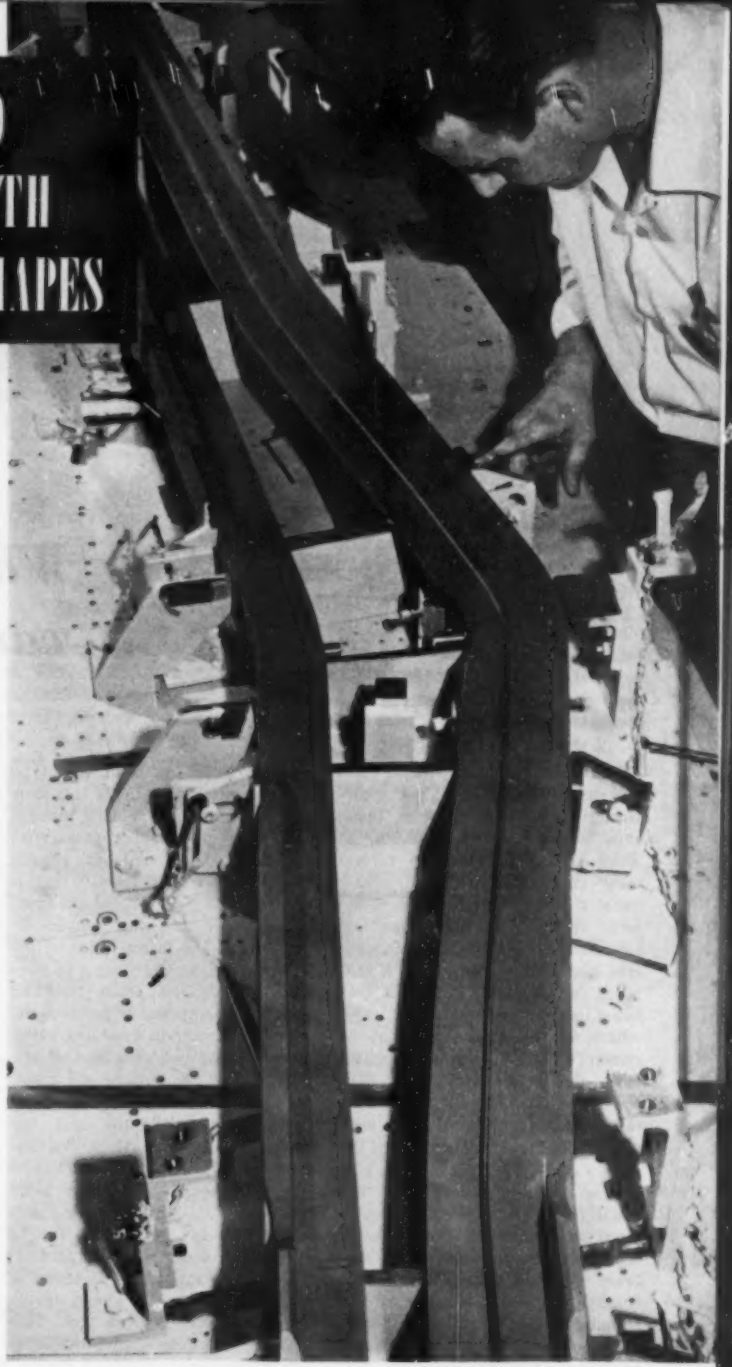

A new method of bending high-strength extruded shapes to close tolerances has been developed at the Lockheed Aircraft Corporation. Jobs that formerly required 30 minutes now can be done in three. Accuracy within five minutes of arc can be held consistently and no special operator skills are required. Bending is performed in a specially designed fixture mounted in a standard hydraulic press. Any shape can be bent in the one fixture — only inserts need be changed for each different shape. Design of the tooling provides for complete control over the process, including the forming angle, temperature of the work, temperature of the bending dies, and springback. On work performed to date, only one piece in ten requires additional shaping operations after removal from the press. Developed by Lockheed Manufacturing Research, this method is generally applicable to all bending operations on high-strength extruded, rolled, or machined shapes. Described in this report are the details of the bending tool, steps in tool planning, the principle of bending by this method, and the auxiliary equipment to obtain top efficiency from the process.

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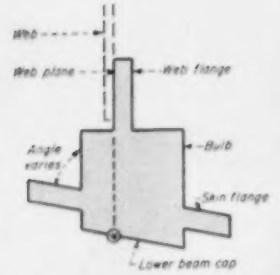
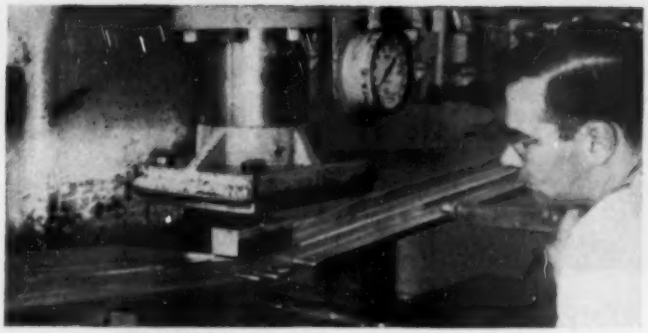


FIG 1 . . Usual wing-beam construction consists of web attached to flange of upper and lower beam caps. Caps require single or compound bend



OLD METHOD of bending was primarily cut and try, required skilled operator. Bending by arbor press required approximately 30 minutes

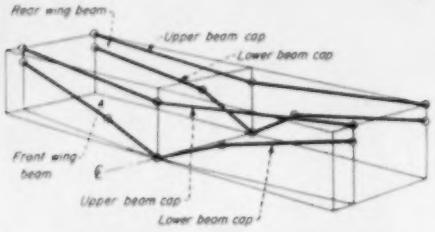


FIG 2 . . Typical wing-beam layout requires single bend in beam caps of rear wing, compound bend in caps in front wing beam

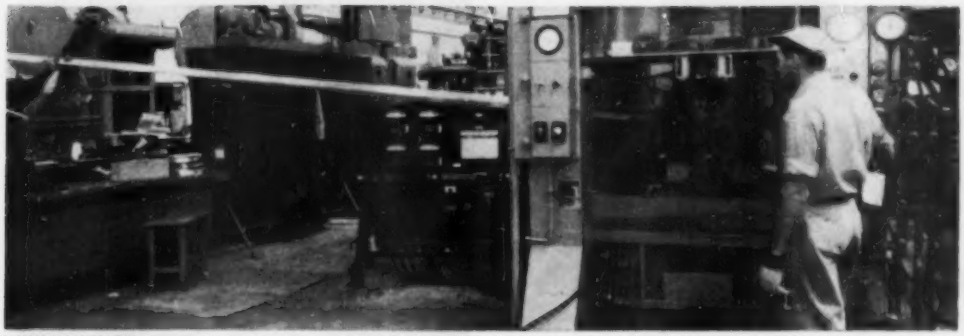
What bends can be made?

Lockheed's bending process was developed initially for high-strength extruded spars or beam caps which must be formed at elevated temperatures. In typical wing construction, Fig. 1, beams usually consist of a sheet-metal web attached to an upper and lower beam cap. The wing in general has a front beam and a rear beam for its major structure. One beam usually lies on a percent line, which, in the plan view, may be normal to the ship centerline. Both the upper and lower caps contain a single bend at the center and form a dihedral angle with the vertical centerline plane of the ship, Fig. 2. The other beam also lies on a wing percent line but usually sweeps forward or backward because of the taper toward the tip of the wing, Fig. 2. This beam, when passing through the centerline of the ship, forms a compound angle, sloping upward (dihedral) in the front view and backward (sweepback) in the plan view. Bends must be made to the correct angles and must be accurately held.

To produce bends of this type by conventional methods is a slow and costly procedure. One method is to bend on an arbor press with the work supported on blocks. The piece is heated locally, then is bent in a series of operations until it matches a checking templet. In some cases, the formed area of the work is cast in Cerrobend to prevent the flanges from buckling under the compressive force of the bend. This method produces satisfactory parts but at a cost of approximately 30 minutes per piece. Bending of this type is primarily a cut-and-try procedure and the operator must be skilled. An improvement over this method is to construct special "developed" bend blocks that control springback and distortion. Fair results can be obtained but the rate of production is extremely low. Because of these limitations, Lockheed developed the new bending tool. This method overcomes previous disadvantages and provides a method of bending that meets the requirements of a modern production process.

Major features of the Lockheed method are:

1. Bending is performed in a specially designed double-acting die mounted in a hydraulic press. Only one stroke of the press is required to complete the bending operation.
2. Extrusions of different shape and cross-section can be produced in the same die simply by changing inserts in which the piece rests during the operation.
3. Most cross-sections can be bent regardless of whether they are symmetrical or unsymmetrical.
4. Bends can be made at any point along the piece.
5. Both single and compound bends can be performed in one operation, it being only necessary to rotate the inserts in which the work is held to produce a compound bend in a single stroke.
6. Bending may be performed with the work at 300 F ± 25. Automatic controls during



NEW METHOD provides complete control over bending process. Forming pressure is the same every time, forcing each piece to the same correct forming angle. Die is held at constant temperature by controls on panel at left. Bend now takes 3 minutes

preheat and during bending eliminate variation, as the bending temperature for a given forming angle is critical in obtaining consistent springback.

7. Dies are heated to 325 F ± 25. Heating elements are controlled automatically to maintain temperature within this range.
8. Depth or angle of bend can be closely controlled, as this also directly influences the accuracy of the bend.
9. Springback and distortion are controlled in three planes. After removal from the press, pieces are within five minutes of arc, which is a deviation of approximately 1/16 in. in 4 ft.
10. All factors affecting accuracy are controlled in the tooling and the setup. Precision work can be produced by unskilled operators without difficulty.

Thus far, extrusions of 14 S-T, 24 S-T, and 75 S-T aluminum alloy have been bent successfully on a production basis. Of these, 75 S-T is the strongest, having a yield of 68,000 psi and ultimate strength of 82,000 psi — values higher than those of structural steel. During bending, of course, values are approximately 50% lower than those listed because of the temperature of the work. After cooling, the piece regains its full strength. Actually, however, the method can be applied successfully to materials of greater strength, the only limitations being the tonnage available in the press and the design strength of the bending die being employed.

Because of the large amount of bending that must be done in aircraft production and the success of the new double-acting tool, a special machine has been designed to incorporate the principles described in this report. This machine, when completed, will replace the present tool. However, for shops in which the volume of bending work does not justify a special machine, the method described here offers a means of performing accurate bends on a production basis, at a relatively low expense for tooling and without the need of a large investment in special equipment.

How to plan bending operations

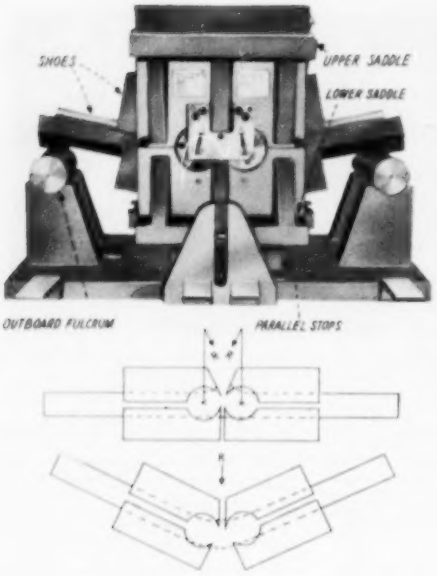
Equipment required for hot-bending by the new Lockheed method include a standard double-acting hydraulic press, a specially designed double-acting die, controls for regulating die temperature, and heating units for jobs heated outside the die prior to the forming operation.

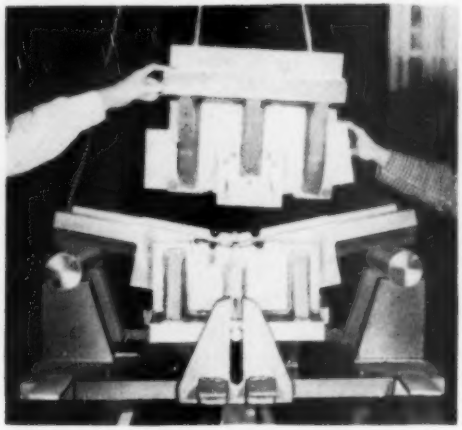
The bending tool consists of a double-acting die with upper and lower inserts held in shoes that rotate about two fixed pivot points. These points are established by the centers of journals that rotate on bearing surfaces of an upper and lower saddle. Outboard fulcrum points support the shoe assemblies at each end. Therefore, as the main portion of the tool moves downward, the shoes rotate, thereby bending the work.

Hydraulic press is standard

The press currently in use at Lockheed is a 650-ton unit and is capable of forming 75 S-T up to 12 sq. in. cross-section. Main ram capacity is 500 tons, but only approximately 125 tons are required to form the beam caps previously mentioned. The blank-holder ram of 150-ton rating is not used.

The 150-ton hydro-pneumatic cushion supports the lower saddle and can be set to maintain proper pressure against the upper saddle during the forming stroke. The main ram, bearing on the upper saddle, forces both saddles down and is resisted by the cushion force plus the bending force required to form the piece. At the bottom of the stroke, the main ram is stopped by two parallel blocks of proper





Double-acting bending tool contains four shoes that rotate about the journals in each saddle. Inserts within each shoe hold the work. The upper saddle attaches to the press ram, the lower to the press bed. Outboard fulcrums support ends of the shoes in the lower saddle, causing the shoes to pivot and thus creating the bending action. The two arrows in the upper sketch, left, move and become the single arrow in the lower view. As bending starts (as in upper sketch), two radii start forming from outer tangent lines and become one radius when bend is completed

height to produce the correct angle.

The amount of pressure required in the cushion depends upon the force necessary to keep the upper and lower shoes together during the forming operation. Trial-and-error tests determine the minimum pressure. Any pressure above the minimum is satisfactory as long as the main ram of the press has sufficient force to bend the beam and also force the cushion to close. For the wing beam caps, the cushion is set for 60 tons.

While any standard hydraulic press can be employed for bending by this method, final forming pressure must be constant to obtain consistently accurate bends. With the particular hydraulic system on the Lockheed press, it is difficult to stop the ram immediately upon touching the parallels. Delay, only for an instant, causes the hydraulic pressure to build up to maximum press tonnage. This tends to distort both the bending tool and the bed of the press. To avoid this, the press has been equipped with a secondary relief valve that controls the press reversal switch. With the valve set for 125 tons, the operator allows the relief valve and switch to stop the press, thereby creating a final pressure that distorts the bed of the press and the base of the die the same amount each time. As the height of the parallels takes this distortion into consideration, the bending tool always is forced to exactly the required angle.

Compound bends made in one operation

Prior to development of the Lockheed method, typical compound bends were produced in two operations. Beam caps, for example, were bent upward in one operation to form the dihedral angle, and then back in a second operation to form the sweepback angle. However, as can be seen in Fig. 3, both the dihedral angle D and the sweepback angle S can be formed at the same time by a single bend in the plane "EGO". This common plane can be determined by trigonometry, if both angles are known, or by descriptive geometry from the loft layout.

In the newly developed double-acting bending die, the bending action takes place in a vertical plane termed the "forming plane," Fig. 4. The resultant plane in which the angle lies after the bending forces are released is termed the "bend plane." This is the result of the bending action plus any subsequent distortion and springback.

Springback may be defined as the process of elastic recovery which occurs when the pressure exerted to bend the piece is removed. Springback usually occurs in two planes, the forming plane and the plane of rotation. The radius in the tool must be made smaller to compensate for this phenomenon, Fig. 5.

Control of springback

If the piece is symmetrical about the bend plane, type I, Fig. 6, the forming plane and the bend plane are the same—that is, the bending action actually is made in the bend plane. Springback occurs only in this plane and can be compensated for by overbending. It is only in the case of symmetrical sections that this is true. Unsymmetrical sections require special attention to overcome the effect of springback.

Because of the unbalanced areas above and below the neutral axis, type II, Fig. 6, elastic recovery is not balanced, so distortion occurs after the bending operation is completed. If the piece must be formed so the vertical web lies in a plane after bending, it is necessary to rotate the cross-section to compensate for this distortion.

In many cases, it is possible to analyze the cross-sectional area distribution in relation to the bend-plane axis and determine the proper direction of rotation which will compensate for this distortion. The original tool design layout in this case should provide for this correction although the exact amount in degrees must be determined by trial and error.

How to rotate complex sections

In Fig. 7 (b) fibres in the upper portion of the piece are held in compression at the bottom of the forming stroke, while those below the neutral axis are held under tension. Upon removal of the forming force, the upper fibres, most of which are the *A* quadrant, elastically recover and *increase* in length, while the fibres in the *C* quadrant recover and *decrease* in length. This causes the plane *ac* (or web flange) to bend and carry with it the vertical web. By rotating the cross-section to the left before forming, the forming action will put a slight bend in the *web* in the direction opposite to the direction created by the forces of the web flange. With proper degree of rotation, these forces are "balanced" and the web will be produced in one plane.

If any portion of the flange in the bend area is removed in a later operation after forming, thereby releasing stresses, the piece may again spring out of contour. If the above is necessary, the piece must actually be formed out of contour in such a manner that it will spring into contour when final machine cut is made.

Inserts rotate work

The new bending die is designed to accommodate extrusions of all

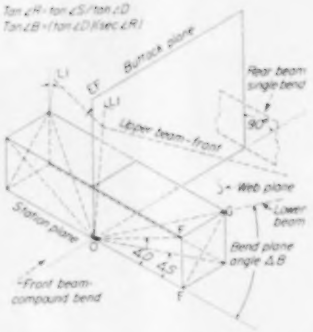


FIG 3 . . Compound angle including dihedral angle *D* and sweepback angle *S* can be formed by single bend in plane *EGO*

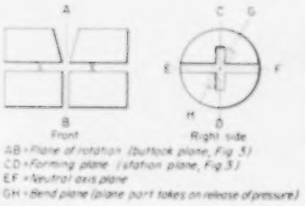

Front
Right side
AB = Plane of rotation (buttock plane, Fig. 5)
CD = Forming plane (station plane, Fig. 5)
EF = Neutral axis plane
GH = Bend plane (plane part takes on release of pressure)

FIG 4 . . Main Planes of the Bending Tool

FIG 5 . . Springback in the bend plane must be compensated by a forming radius in the tool that is smaller than the radius desired in the piece

shapes. Inserts, which are attached to the upper and lower shoe assemblies, make the tool universal. For various shapes, it is only necessary to provide an insert of correct design for the job and attach it to the shoes.

Inserts are machined from 7-india hot-rolled steel. The stock comes sufficiently oversize to turn on a lathe and clean up 90%. Sections 9 in. long are cut and faced. The cross-section layout of the work, as shown on the tool design, is scribed on each end of the section, which then is rough-sawed in half. Each half next is milled to the scribed line. Attaching holes, keyways, and other minor details are machined, and the gripping faces are polished and made ready for the tool test.

The position of the insert in the shoe determines the plane in which the web flange is held during the bending operation. On symmetrical cross-sections, the insert is so attached that the web flange of the piece is held in the vertical or forming plane. However, for unsymmetrical pieces, the insert is rotated about its longitudinal axis so the web flange of the piece is held in the correct angular position.

The tool designer indicates the approximate degree of rotation required. The toolmaker then keys the inserts to the shoes, with a special offset key stocked in 1, 2, and 3° increments. The key can

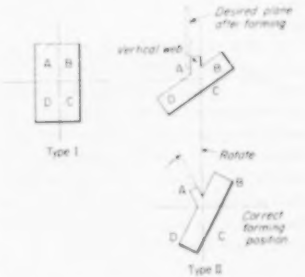


FIG 6 . . Symmetrical shapes, type I, can be formed in the bend plane; unsymmetrical type II, must be rotated

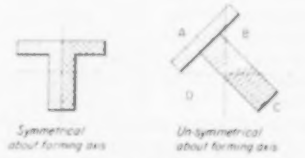
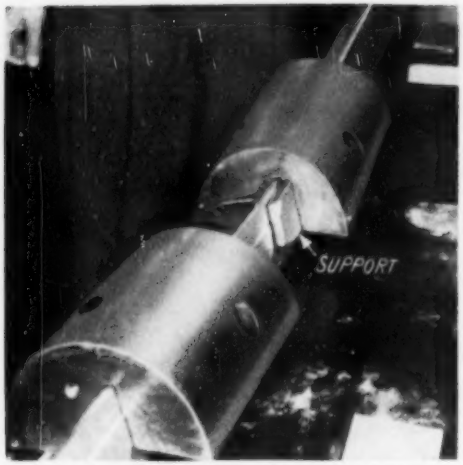


FIG 7 . . Rotation also is required on symmetrical shapes if they must be formed in a position that makes them unsymmetrical about the forming axis

be reversed for opposite hand rotation. After the proper degree of rotation is developed, the slot in the insert is welded and a new slot machined. This slot conforms to



Gap support between two inserts, purposely separated to show support, minimizes buckling in bend area not enclosed by inserts

Removable sections are provided in inserts for compound bends to avoid having the piece locked in the insert when the bend is completed. Letters *NA* denote neutral axis

the proper degree of rotation and requires only a standard ½x½-in. key for the future production setups.

In this way, the highly skilled task of establishing the correct angle to obtain the required bend is performed only once by the toolmaker who makes the inserts. Thereafter, it is only necessary to attach the inserts to the shoe and the keyway automatically aligns the insert to hold the piece correctly for the required bend.

Die access—gap support

Inserts for compound bends and for unsymmetrical pieces usually required special techniques to obtain "die access". Because the piece lies in the inserts with webs running in directions other than vertical and horizontal, the piece may be locked in the insert at the bottom of the forming stroke. Removable or sliding sections in the insert are required.

Removable sections are of two general types: (1) disposable, (2) permanent. The throw-away type consists of a bar that is bent with the part, and thrown away or remelted after each bend. Bars are machined from steel or cast from a material such as Kirksite. The second type is made as a detail of the insert and is slotted to provide sufficient die access so the part can be removed without interference.

In addition to permitting die access, removable sections also support the flanges and webs of the piece in the area between the left- and right-hand inserts. If left unsupported, the flange or web would buckle under the severe compressive force during bending.

Establishing forming angle

In planning a setup, the distance between the lower saddle and the base plate at the bottom of the press stroke determines the magnitude of the forming angle. Approximate settings are pre-determined. Exact values are established during tool tryout. The die, empty, is forced down until pointers attached to the pivot points read the desired degree. Parallels are cut to size, are placed under the tool and are shimmed until a correct part is produced. New parallels then are machined to the developed dimension and are identified as a part of the standard tooling for the job.

When operating at elevated temperatures, bearing surfaces are treated with a molybdenum-disulphide lubricant every 50 to 100 pieces. The only other tool surfaces requiring lubrication are slotted guides in the base plate and the rubbing surfaces of the outboard fulcrum points. However, lubrication is added to the work in the general area of the bend before the forming operation is started.

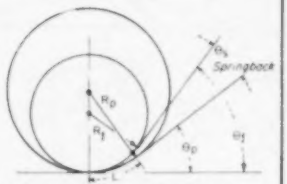
Allow for distortion

Changes in cross-section in the bend area are governed by the shape of the cross-section about the forming-plane axis. This determines the magnitude of compression strains in the area above the neutral axis and the tensile strains in the area below the neutral axis. The deformation of a *symmetrical* section can be approximated to a fairly accurate degree, but the change in cross-section of an *unsymmetrical* section is more difficult to predict. Before the final Engineering drawing is released, it may be necessary to conduct preliminary tests to establish proper extrusion size from the mill.

If the loss of material in the "shrink area" cannot be tolerated, extra material must be added to the base extrusion and sufficient material must be left in the shrink area during milling. An extra milling operation after forming may be necessary to remove surplus.

Swelling in the compression area also may require a final milling operation after forming. It is

HOW TO DETERMINE THE FORMING RADIUS



R_p = Radius given (part radius-neutral axis)
R_f = Tool radius required (forming radius-neutral axis)
θ_p = Part angles given
θ_f = Forming angles (part angle and springback*)
L = Neutral axis length (must remain unchanged)

$$L = R_p \times \theta_p \frac{\pi}{180}$$

$$L = R_f \times \theta_f \frac{\pi}{180}$$

$$R_p \times \theta_p \frac{\pi}{180} = R_f \times \theta_f \frac{\pi}{180}$$

$$R_p \times \theta_p = R_f \times \theta_f$$

$$R_f = \frac{R_p \theta_p}{\theta_f}$$

FIG 8

* Note: Springback angle is obtained from empirical data or can be calculated, but calculation is difficult for odd shapes. The practical springback angle for cups formed at Lockheed ranges from 1 to 3°.

HOW TO FIGURE BENDING STRAIN

$$\%\text{ Elongation} = 100 \times \frac{e}{L} = \frac{kT}{R_1} \times 100$$

R_1 = Tool radius required for forming

FIG 9

important, therefore, that the part designer, whenever possible, allows for swelling or shrink in the forming segment, and thereby saves the need of special operations.

"Orange peel" or "necking" is a term given to the rough surface created on the surface of the material in the stretch area. The greater the degree of strain, the greater the amount of "orange peel." Under certain conditions, "orange peel" also occurs in the compression area. In most cases, this phenomenon is not detrimental and is acceptable by Inspection. However, it is advisable to obtain proper notes on the drawing to allow for distortion and surface condition in the forming area.

How to design die inserts

When extra material is required to compensate for shrinking of cross-section, the tool design drawing should indicate not only the finished cross-section but also the cross-section before bending. A note should be included to allow the toolmaker to shape the die insert to fit the maximum tolerance of the cross-section that will be furnished for the bending operation. The radius of the tool is determined by the method given in Fig. 8. The forming limit is governed by the amount of stretching the outer fibres of the metal will permit under the stress conditions prevailing in the bend.

To determine the magnitude of strain in the outer or inner fibre it is necessary to consider the length being acted upon and the amount (e) of deformation, Fig. 9.

$$\%\text{ Elongation} = 100 \times \frac{e}{L} = \frac{k\,T}{R_i} \times 100$$

The above calculation should be made using the radius which is required on the tooling. The value obtained must not exceed the value for maximum elongation specified in handbooks for the material being formed.

To check the accuracy of this procedure, a grid was scribed on spar specimens before bending and the strains were analyzed after bending. The practical results correlated fairly well with results obtained from the above formula.

How to control temperature

Some materials, such as 75S-T, must be formed at elevated temperatures because of Engineering requirements. Other materials, such as 14S-T and magnesium alloys, may be bent cold as far as Engineering is concerned, but require heat, in most cases, to improve the forming characteristics of the metal. In general, heat lowers the yield strength, increases elongation, and minimizes springback. Two methods have been employed to heat pieces:

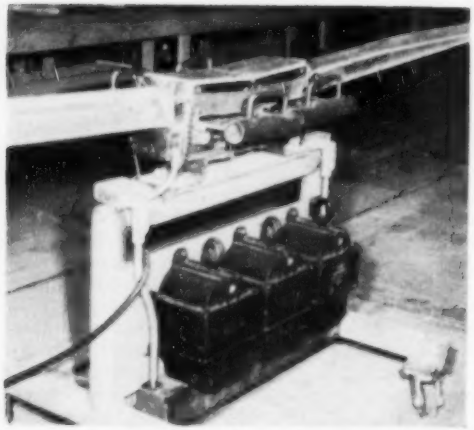
1. Only the die is heated. The piece is placed in the die and is brought to temperature in the die before beginning the forming cycle. This method is satisfactory only for parts of small cross-section.
2. The part is preheated and is placed in the die at the proper temperature for forming. The die also is heated to prevent excess loss of heat from the piece before the forming cycle is completed. For all parts greater than 1 sq in. cross-section, preheat is recommended.

Two methods have been developed for heating work in advance of placing it in the bending fixture: The first, which is in common use, is conduction heating. The second, which shows considerable promise, is heating by radiation.

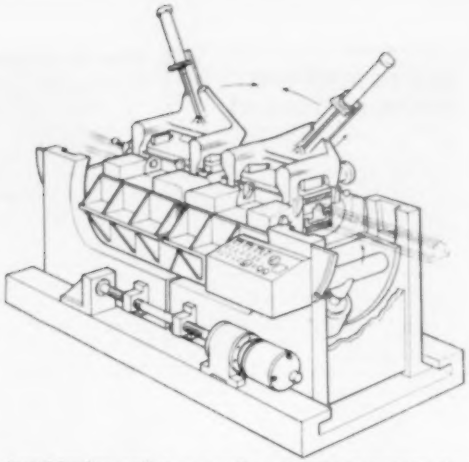
Heating the piece by conduction

In conduction heating, platens shaped to the piece configuration are heated by tubular cartridge heaters so the temperature is maintained at, or slightly above, Engineering limitations. The piece is placed in the heater and left until the proper forming temperature is reached. For example: the T-33 beam is formed at 325 F ± 25. It reaches this temperature in 12 min when the heater itself is maintained at 350 F. If the piece is left in the heater longer than 12 min, no additional rise in temperature is noticeable as there is a gradient of approximately 25 F between the contact surfaces of the heater and the piece because of the lack of 100% contact between the two. The length of time the piece may be left at this temperature is governed by Engineering requirements. These pieces being 14S-T may be held as long as three hours at 325 F ± 25 without impairing their original strength.

It is important that the piece does not exceed the maximum temperature allowed nor the time lim-



Beam heater brings heavy section up to 300 F in 12 min. Heating is by conduction. Piece can not overheat. Unit contains twelve 700-watt cartridge heaters



Special bending machine now under construction incorporates the principles of the bending method described here. Self-contained hydraulic system will rotate trunnions to bend work to pre-set angle. Inserts holding work will rotate about their longitudinal axis to position work at correct degree of rotation for bend. Setup will be faster and job change-over easier

itations, but it also is important that it be removed at the specific temperature desired for the forming operation. The die setting for each bend is established with the beam at a *specific temperature*. Each 5° temperature variation in the piece varies the angle five to ten minutes according to specific part geometry. In the bending work being performed at Lockheed this is approximately the maximum deviation allowed.

To achieve accurate control of the temperature of the work immediately before the forming cycle takes place, the temperature rise in the piece is charted on a tape recorder. The exact forming temperature desired is indicated by the flash of a colored light operated by the tape recorder. This insures control of one variable in the bending process. Another variable, the angle to which the beam is bent in the press, is made constant by mechanical means. The only other variable is the physical properties of the material as received from the mill. Experience has shown that if the first two variables are controlled, satisfactory results will be maintained.

Heating by radiation

Radiant heaters have been tried for preheating large beam caps and have proved very satisfactory as a means of heating, although temperature control is not adequate at present. Heaters recently developed consist of six 1800-watt "Chromolox" radiant heaters assembled into a semi-cylindrical shape. The heater is lowered over the cap so individual heaters direct their rays to the part.

Control of die and piece temperature

Six cartridge heaters of 500 watts each are applied directly to each of the four shoes of the die. These are wired in parallel in each shoe. The experimental bending fixture originally incorporated thermoswitches imbedded in the inserts to control the heating temperatures. However, as the jar of the forming operation caused erratic operation of these devices, a thermocouple in each shoe was substituted and now is used in conjunction with an electric "Pyrovane" control unit. The control unit consists primarily of accurate direct-reading millivolt meters operated by the current developed in the welded junction of the thermocouple. Four "Pyrovanes" are provided, one for each shoe. The controller carts include a Brown "Electronik," a recording unit for indicating and recording, if necessary, the temperature of the workpiece.

Suitable access holes are cut into the body of the bend fixture so a thermocouple can be placed directly against the piece to obtain accurate temperature readings during the time the work is in the press. If the "Electronik" instrument indicates a piece temperature in excess of the maximum allowed, the power source to the die heaters shuts off automatically.

Check and straighten

Work is checked by templets or in a check fixture directly after forming. Both rotation tolerance and tolerances for angle deviation are checked.

When required, a conventional arbor press, equipped with special holding devices, is used to make minor corrections in the angle after forming. To date, only one beam out of ten requires correction. It is mandatory to reheat 75S-T to 300 ± 25 F before making corrections. The cap is locally heated with the radiant heater. Usually, only an angle change of 5 to 15 minutes is required. It is important that the *total* time 75S-T extruded material is held at 300 F does not exceed Engineering limitations.

ROUND TABLE

Merit Inventory

"What are those papers, Al—more red tape?"

"These are the new merit-rating forms we're trying out, Ed. Want to see one?"

"Let's see," mused Ed. "Three, six, nine . . . 36 spaces. You have to do this for every man in your department?"

"Yep. Once a month. Only I just have to mark one of each three spaces. The idea is to grade each worker 'good', 'fair', or 'poor' in each of those qualities. It covers both performance and attitude."

Ed continued reading out loud, ". . . Performance: quality, quantity, responsibility, progressiveness, leadership, attendance—Al, this thing amounts to a diary on each worker. It won't work!"

"It's not as bad as that, Ed. It only takes a couple of minutes for each man. Besides, I think it's a darned good idea. It will keep me up to date on how new workers are progressing and it gives me a written record of my impressions of how everyone else is doing, too."

"It's not practical. You can't take time out to make notes on who comes up with the most fat-headed ideas or who's trying to boss everyone else around out on the floor."

"It's not the details that are valuable, Ed; it's the impression you have of your men. How accurate is yours? A lot of foremen don't keep any kind of record along that line, and it's something you need. It's a check on the men, and on yourself, too."

"Look, Al. I can tell you right now who's goofing off in my department. What else do you need to know?"

"Lots more than that. How about the willing worker that does all the tough jobs? Do you give him any regular credit? You ought to, at least someplace where you can refer back to it. How about the guys who are going stale on their jobs and need a change? They may quit, but if you have these merit-ratings handy, you can probably predict trouble before it happens by looking at trends."

"I'm afraid it's just a lot of foolishness, Al—more paper work that nobody ever reads."

***CAN** a foreman or supervisor benefit from keeping tabs on trends in the performance and attitudes of his workers? Is a rough, written record of value for reference purposes, or is it just a waste of time and energy? Have you seen merit ratings like this work? Discussions of earlier topics appear on later pages.*

Salvage otherwise rejected lots . . .

Determine best draw speed . . .

Draw for optimum qualities . . .

Forecast results, when you know . . .

HOW DRAW SPEED AFFECTS STAINLESS WIRE

BY SAMUEL STORCHHEIM,
Senior Metallurgical Engineer
SYLVANIA ELECTRIC PRODUCTS INC.
Bayside, N Y

Deformation of commercial annealed 18-8 stainless steel at room temperature causes the non-magnetic starting structure, austenite, to transform in varying quantities into the magnetic structure, martensite. During wire-drawing, the degree of change is partially dependent upon the chemical analysis of the melt, the percent of cold reduction given the alloy, and the dia.

Chemically, nickel, manganese, and carbon retard this austenite-to-martensite transformation; while chromium, silicon, molybdenum, and columbium promote it. Each element has its own effect upon the change that occurs.

When the percent of cold reduction of area is increased, there usually is a further conversion to martensite.

Heavy wires receiving the same cold reduction of area (percent) as fine wires, for the same chemical analysis, exhibit less martensite than the finer wires.

While working 18-8 stainless steel wires at the Wilbur B Driver Co, Newark, N J, we observed that even when the preceding factors were kept constant, considerable fluctuation existed in the magnetic properties of the wires produced. Preliminary study showed that this inconsistency resulted from variations in the draw speed of the wire. Hence, an investigation of draw speed, as it affected magnetic properties, ultimate tensile strength, and resistivity, was initiated. Two different 18-8 stainless wires were drawn in a No. 16 CE variable-speed Vaughn wire-drawing unit.

The only variable introduced during the study was the change of drawing speed. Individual wire samples were drawn at speeds from 45 fpm to 3900 fpm. Results are tabulated and graphed.

Property fluctuations are probably caused by the generation of heat in the wire during the draw. Higher speeds through the die mean more frictional heat, and greater wire speed reduces the time for heat dissipation from the wire before it is drawn through another die. This higher temperature probably retarded the austenite-to-martensite transformation, as it is recognized that when the temperature of 18-8 stainless steel rises much above room temperature during cold deformation, this transformation is inhibited. This condition is probably the cause of lower ferromagnetism, tensile strength, and resistivity.

Two different stainless wires were used . . .

STAINLESS STEEL	% CHEMICAL ANALYSIS							
Type	C	Mn	P	S	Si	Mo	Ni	Cr
302	0.08	0.91	—	—	0.59	0.08	9.41	18.39
304	0.07	1.07	0.030	0.018	0.40	0.19	8.47	18.91

Wires were annealed at 2100 F, were 0.016 in. dia, and were individually strung through 13 successively smaller B&S gage dies to 0.004-in. dia. . . .

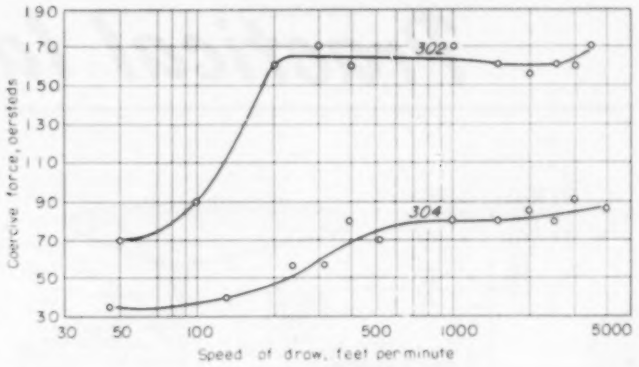
B&S NO.	DIE DIA, IN.	B&S NO.	DIE DIA, IN.
26	0.0159	33	0.0071
27	0.0142	34	0.0063
28	0.0126	35	0.0056
29	0.0113	36	0.005
30	0.010	37	0.0045
31	0.0089	38	0.004
32	0.008		

Total reduction: 93.7%

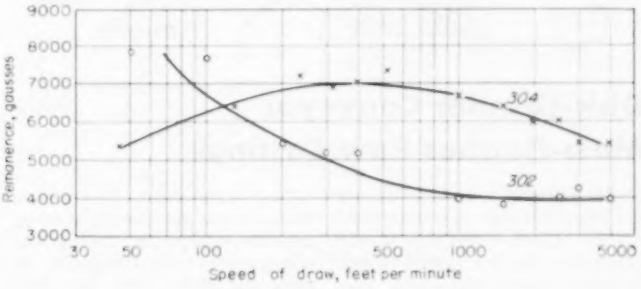
EFFECT OF DRAW-SPEED

NO.	RATE OF REDUCTION, FPM	HC, OERSTED	BR, GAUSSE	ULT TENSILE, 1000 PSI	RESISTIVITY OHM-CM FT
302					
1	50	70	7850	395	555
2	100	90	7700	385	540
3	200	160	5450	372	500
4	300	170	5180	369	500
5	400	160	5180	372	500
6	1000	170	4000	372	490
7	1500	160	3850	369	500
8	2000	155	4250	356	510
9	2500	160	4000	365	500
10	3000	160	4250	372	490
11	3900	170	4000	372	485
304					
1	45	35	5330	372	615
2	130	40	6400	357	610
3	235	55	7200	361	600
4	315	55	6930	361	595
5	395	80	7070	357	585
6	510	70	7330	357	590
7	1000	80	6670	357	580
8	1500	80	6400	357	570
9	2000	85	6000	350	560
10	2500	80	6000	357	560
11	3000	90	5460	357	555
12	3900	85	5460	357	555

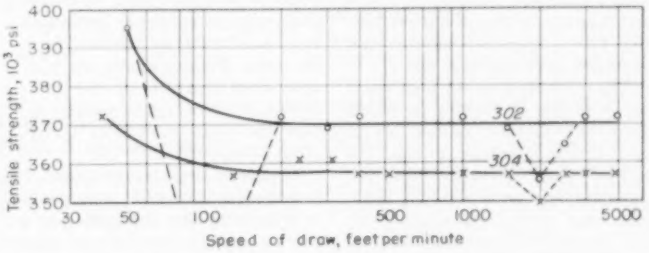
Coercive-force-vs-draw-speed curves for both analyses are similar in appearance, except that they are displaced from each other. As draw speed increased, coercive force (Hc) increased until it stabilized. Both rate of increase and values in Hc were greater for 302 than for 304. This was attributed to higher carbon and nickel in 302. Maximum Hc for both specimens was 143%



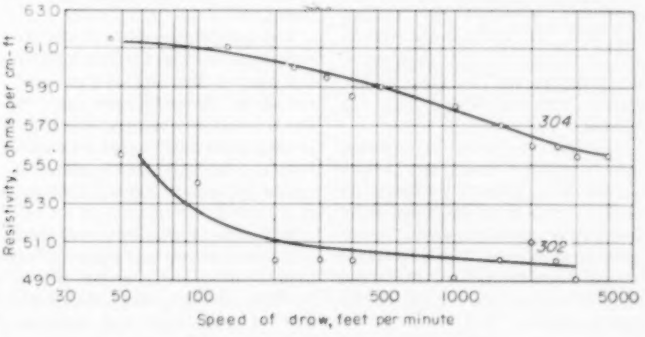
Remanence-vs-draw-speed curves show that remanence (Br) for the two specimens is not as closely similar as the two coercive-force curves. Indications are that from moderate rates of draw to fast rates (200 to 3900 fpm, respectively) the alloy (302) having higher carbon and nickel content exhibited lower residual magnetism



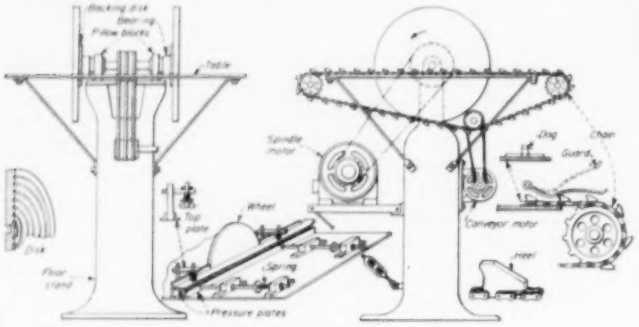
Ultimate-tensile-strength curves are similar in appearance except that, again, they are displaced. Both show an initial decrease from 45 fpm to about 200 fpm, after which they level off. Maximum decrease is 6.0% for 302 and 4.0% for 304. Low value for 302 at 100 fpm is believed caused by imperfections created in wire during draw. Dips at 2000 fpm were probably caused by mechanical fluctuations of the drawing unit. Curve displacement is attributed to higher carbon content of 302



Electrical-resistivity-vs-draw-speed curves are not similar, but both show a continuous decline with increasing draw-speed. 302 levelled off after 200 fpm, while 304 shows a continuous drop. For both, maximum change is about 10%. It appears that higher nickel and/or carbon, for a particular draw speed, lowers resistivity



Practical Ideas



Disk-Grinder Conveyor Mass-Finishes Raw Castings

SMALL CASTINGS have to be burred by efficient means to keep costs within reason, especially if the product is highly competitive and is made in large quantities. This shop-built machine does the job with a minimum of operator effort, and actually increased our production 730%, improved quality, and extended abrasive-disk life.

The machine base is a floor stand for a sander or buffing machine. Two ball-bearing pillow blocks and thrust bearings mount the central shaft. Backing disks are mounted against the thrust bearings, and special aluminum disks are mounted against the backing disks. These aluminum disks are spiral-grooved, chamfered, and dynamically balanced for smooth operation. The cloth abrasive disks are cemented on, and, because of the grooves, can be used immediately with no drying time required.

The spindle motor is mounted low on the floor stand, and is connected to the spindle by belts and pulleys. Power to the feed chain is from a small conveyor motor running at 25 rpm. This is mounted on the opposite side of the stand to help balance the weight of the spindle motor.

A quarter-in. plate, three ft square, is the table. This mounts the sprockets for the chain drive, provides location for the top and side pressure rails, and guides the work and chain. The chain is a special assembly with blocks assembled into the chain to fit the particular work being smoothed. The chain rides on the surface of the table. The dog blocks are made with heels that rest on the chain behind them, which provides support and keeps the blocks aligned at all times.

A sheet-metal safety guard is provided to swing on a hinge so it will warn the operator that a block is approaching the load point. This raises to allow slipping a workpiece onto the chain at the load point.

Top and side pressure plates are necessary to hold the work down and against the face of the abrasive disk. Their location controls the amount of material removed, so they must be mounted carefully. Both are spring-loaded to allow for minor variations in part thickness and burrs.

With the workpieces we were smoothing when this rig was first made, production was 800 pc per hr. The abrasive cloth was a 36-grit material. *Joseph F. Budnick, Bellerose, N. Y.*

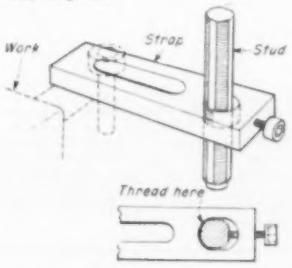
Partly Threaded Strap Has Clamping Flexibility

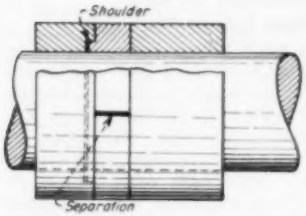
HERE IS A CLAMP STRAP that solves the problem of finding a heel of just the right height for a clamping setup on a mill or drill table. It is adjustable up and down in increments of 1/40 of an inch or more, depending on how fine a thread is cut.

The strap is conventional except that its back end is drilled and tapped. We made this thread at 10 tpi, although it could be almost anything reasonable. The back edge of this hole was slotted out to leave an elongated hole. A setscrew was put through the back edge.

A stud was made to act as the universal heel for this strap. This was cut from ⅞-in.-sq steel, but was turned and threaded to produce 1-in.-dia, 10-tpi threads. These appeared only at the corners of the stud, of course, leaving bare flats on four sides.

The stud is slipped through the hole in the strap, the strap is adjusted to height, then the setscrew is run up against a flat on the stud. The setscrew holds the stud against the threads inside the elongated hole in the strap, preventing up or down motion. For adjustment, all that is necessary is backing off the setscrew, moving the stud up or down, then retightening the setscrew. For smaller adjustments, the stud can be rotated instead of raised or lowered. If we rotate it a quarter turn, the strap will be raised or lowered only 1/40 in. *Allan Clarke, Rochdale, England.*

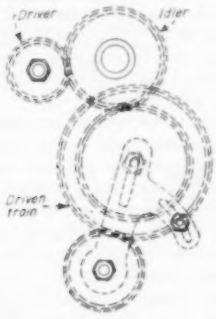




Simplified Arbor Collars

THE ARBOR COLLARS suggested by Robert Laimboeck (*AM* April 28 '52, p 125) can be made easier by using a shoulder instead of keys that fit in difficult-to-machine keyways.

One counterbored collar must be assembled on the arbor first, then shouldered collars made to fit and split down the middle can be added without doing anything more involved to the arbor. This is particularly convenient when you are changing the spacing between two ganged cutters where you are straddle-milling. *A. Vetsch, Steffisburg Station, Switzerland*

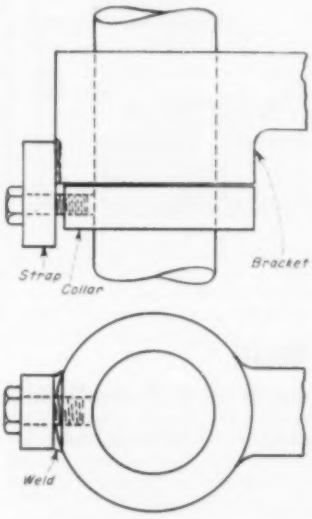


Gravity Bearings Support Idler Gear

THIS KINK is for those rare cases where everything the book says has to be thrown out. We had a gear train to set up, but the bearing bracket that supported the largest gear wasn't long enough to allow the gear to mesh with the small gear that was driving.

We found that we could insert an idler under the illustrated conditions without providing any bearing support whatever — the idler just ran there, balanced only by the gear teeth, and held in place by its weight.

The size of the idler had to be adjusted before we got a good running condition. Too large a gear would jump out of mesh as soon as power was applied; too small a gear would wedge between the large gear and the driving gear. *R. Mery, Farmingdale, N. Y.*



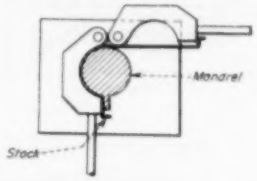
Bracket Locks Without Marring Shaft

A BRACKET can be locked to a shaft or machine spindle without scarring the shaft if this method is utilized.

The bracket is drilled to slip easily on the shaft, then a collar is made to about the same OD and ID. This is drilled and tapped. The bolt to fit it is assembled through a hole in a strap welded to the edge (top or bottom) of the bracket. This strap overhangs the bracket enough to allow reasonable thickness of the collar, but not so much that it can be bent when the bolt is tightened.

The bracket is locked to the shaft by tightening the bolt, which pulls the collar toward the strap side of the bracket, and provides compression on the shaft.

A flat is machined on the collar at the hole to provide clearance between the collar and the strap. *L. Kasper, Philadelphia, Pa.*



Clamping Die Forms Round Springs

THIS BENDING DIE forms open-end springs from 0.064-in. soft steel strip stock. It is hand-operated at the bench.

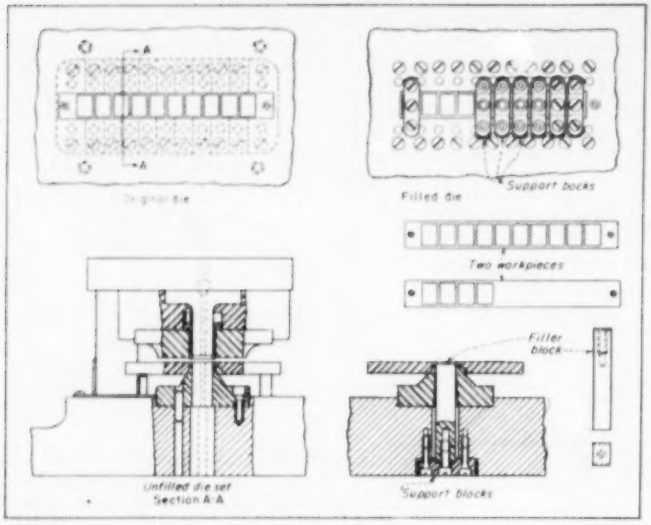
The hinged bending blocks and the central mandrel were cut to shape, then hardened. The sharp bends were formed on a power brake first, then the final curving bend was made with the illustrated equipment. *T. H. Hsu, Taiwan, Formosa.*

Magnets Find Balance Of Flywheels

ANOTHER USE for the little Alnico magnets now commercially available is in finding the amount and location of static unbalance in flywheels and other rotating parts. The old way—using blobs of putty—is easily beaten by the magnets because they are so quickly moved from position to position.

A number of magnets are weighed and marked with their weights. Unfortunately these do not come in exactly convenient sizes, like ¼, ½, ¾, and 1 lb, but their cleanliness, mobility, and convenience make up for this disadvantage. *A. H. Poole, Renfrewshire, Scotland.*

CHECKING NOISY MACHINERY can be done rapidly by using a second-hand hearing aid with the volume turned up full. You can move the pickup and power unit of the hearing aid around the machinery easily, and can locate the point of greatest noise. *Fred Lettino, Astoria, N. Y.*

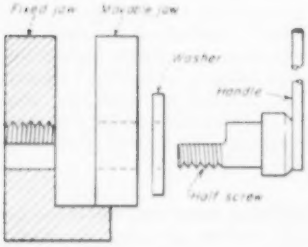


Die-Filler Blocks Support Thin Punch Wall

THIS COMPOUND DIE was originally designed to blank and pierce a product with ten rectangular openings, but a similar part with four openings could also be run through the die set. Once we tried this, we found that the unsupported shearing action fractured the thin wall of the backup punch.

To overcome this condition, a series of filler blocks were mounted on blocks with rounded ends to fit into the punch openings left where the original punches had been pulled. The assemblies were screwed into the bottom of the die to provide support.

No punch cracking has resulted since this change, so we now always insert filler blocks when punches are pulled for the job. *F. C. Elmo, Dayton, O.*



Half Screw Clamps Jaws Rapidly

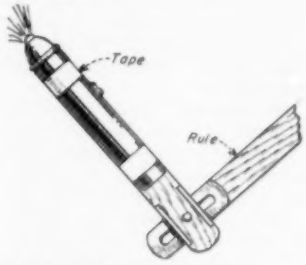
THIS CLAMPING DEVICE is capable of exerting great power, but is also quickly released to clear the work.

The jaws are soft steel, as is the washer. The bolt is a conventional capscrew with a lever brazed to its head. Half the dia of the capscrew is milled off. After tapping the fixed jaw, half of the threads there are removed by slotting, grinding, or filing.

To maintain good thread engagement, the washer thickness must be changed for each job. Actually, the screw is held in alignment by the hole through the movable jaw, so the bottom of this jaw must be backed up by the lower lip of the fixed jaw at all times. This lip may be lengthened so the clamp will take thicker work. *R. J. Dodson, Chicago, Ill.*

Flashlight on Rule Gets Behind Machinery

A PRESS SHOP or heavy-machinery department is a good application for this little idea, which is to tape a penlight to the end section of a folding foot rule. The swivel on such a rule is usually strong enough and grips tight enough to allow setting the angle, then extending the rule behind or between machine members. *Fred Lettino, Astoria, L. I.*

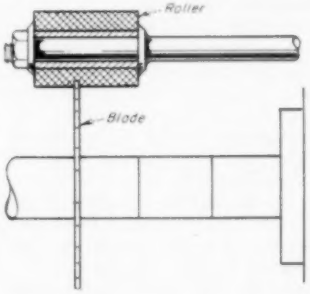


Rubber Roller Clears Saw Chips

WE WERE HAVING DIFFICULTY with a thin cutter on a milling machine. The job was to be sawed ¼ in. deep at a 30° angle to the surface, but we ran into cutter breakage at a high rate.

By experimenting, we found that a rubber roller mounted on the machine frame to ride against the back edge of the saw would clear chips well. This was actually a rubber sleeve mounted on a free arbor. As the work progressed, the saw cut the rubber somewhat, but this just improved action.

Blade breakage was reduced to one for each 2000 cuts. *Leonard T. Smith, Liverpool, England.*

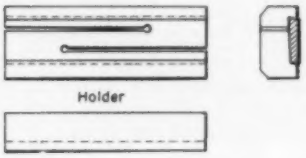


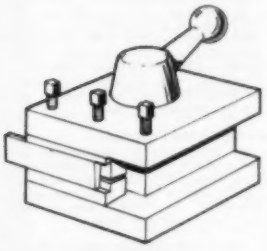
Precision Lathe Feed Uses Compound Angle

WHEN ACCURACY greater than you normally get with the carriage and cross-slide dials is required on a lathe, as sometimes happens nowadays for finishing cuts, you can increase accuracy as much as ten times by setting the compound at an angle and advancing the tool by means of the compound dial. This little chart shows what you get at various angles.

Angle of Compound		Metal Removed per Each 0.001 in.	
Deg	*Min*	*Facing*	*Turning*
2	52	0.00005	0.0001
5	45	0.0001	0.0002
14	29	0.00025	0.0005
30	0	0.0005	0.001

These angles are measured from the centerline of the lathe. Top accuracy is not required in setting the angles, although they should be as close as possible. *Franklin Rieske, Lewisburg, O.*





Cutoff-Tool Holder Has No Overhang

GETTING CLOSE to the face of the work is sometimes a problem in cutoff work. This holder grips the tool firmly, yet is actually farther from the work than the tool itself.

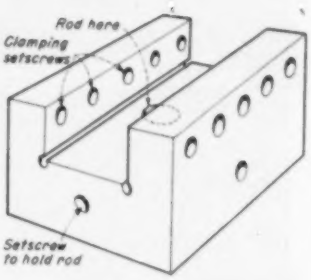
The holder is a block of good steel machined to hold the tool as illustrated. Two saw cuts are made from opposite ends of the block to allow flexibility for clamping and releasing the tool. The assembly is mounted against the side of a square turret.

The holder is heat-treated after machining to provide spring temper, which increases flexibility and resistance to work-hardening. *Max Karfunkel, Haifa, Israel*

Setup Block Works On Lathe or Grinder

ODD-SHAPED WORK can be gripped with this block, which is made of tool steel, hardened, and ground.

It will handle work on the table of a grinder that can't be gripped by a conventional vise. Setscrews through the tapped holes in the sides can be adjusted to compensate for irregular contours. A movable jaw can be approximated by setting a small parallel between one side of the work and one side wall of the block. This is tightened by the setscrews behind it. Non-parallel work can be gripped in this manner, too.



On the lathe, the block is set up by clamping the end of a ½-in. rod through the round hole in the bottom, gripping it with setscrews through the radial holes. The rod is chucked, and the work is mounted and located and gripped by setscrews through the sides of the block. Thus, the block chucks work that would be difficult to hold any other way. *Sam Winston, Brooklyn, N. Y.*

Button Block Does Precise Hole Locating

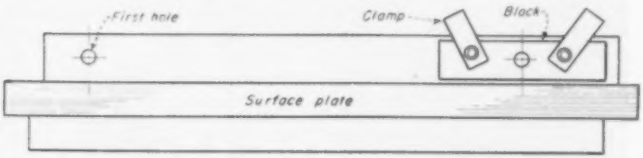
THIS DEVICE is a variation on the old diemaker's button, and is used the same way. Being a special block, it is easily formed to the best shape and size for the specific locating job you are doing at the time.

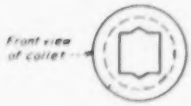
For example, assume you have to locate two holes at opposite ends of a long piece of stock. It is too long to locate on the lathe faceplate, and a jig borer is not available.

The first hole, at the left end, is drilled with fair accuracy by conventional means. Measurements must be close, of course. The other hole can be drilled as easily, but the critical dimension between holes is difficult if you have no table with accurate traverse.

From the first operation, the first hole is already located with accuracy from the end of the piece. Therefore, it should be possible to locate the second hole from the same end of the piece. The button block is drilled and reamed, and may be hardened and bushed. During this process, the length of the block is set at some convenient dimension, as is the length from the hole to one end of the block.

Location of the block against the work and drilling the work hole is done just as if the block were a regular button. *J. C. Magee, Schenectady, N. Y.*





Special Broached Collet Holds Two Stocks

WE HAD several hundred parts to be turned on an engine lathe. The outside shapes were mixed hex and square, although sizes were all the same in each shape. We could do the turning from square and hex stock, but chucking was difficult.

A regular collet on the lathe mashed the sharp edges on the stock, but this was not desirable, either from functional or appearance viewpoints. We knew we could mill the square and hex shapes later if we used large round stock, but we thought this would be wasteful and expensive. We didn't want to hold the work in 3- or 4-jaw chucks because they, too, would mar the stock.

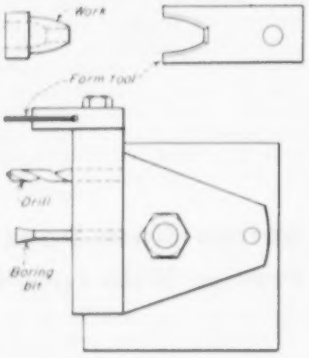
Our solution to the problem was to make the illustrated special collet with a broached gripping section that would take either hex or square stock without marring either. This eliminated the marring action, and was faster and cheaper than either of the other two ways of holding. *Bernard A. Rogers, Uxbridge, Mass.*

HSS Form Tools Salvaged by Regrinding

DOVETAILED FORM TOOLS, as used on automatic lathes and multi-spindle machines, are worth salvaging, especially where a number of different sizes are utilized to allow grinding them down. They usually break at the dovetail, so we can grind a new dovetail into the back edges of the tools to allow new setup.

We make six different sizes of tools from bar stock, ranging from 1 by 1½ to 2 by 3 in. If enough stock is left, we can simply grind in a new dovetail and reduce the width of a larger tool to make a smaller one. If less stock remains, it is often possible to turn the tool 90°, making the old width the new depth, etc.

An abrasive cutoff wheel is used when there is a lot of stock to cut away. Shaping and hardening are eliminated by using the old tools, and we save several thousand dollars a year by getting all we can out of our tools. *A. E. Salmons, Dixon Valve & Coupling Co., Philadelphia, Pa.*



Lathe Saddle Works Like Turret

FOR SECOND-OPERATION WORK, we sometimes use this kind of bracket on the cross-slide to carry two or three tools. This saves on setup time, allowing faster work.

The important thing is getting the tools aligned and located correctly. This job required drilling and boring the central hole in the work, then finishing the outside shape with a form tool. The operations were planned this way: First, forming; second, drilling; and third, boring. We can align the tools, in succession, by reading the cross-slide dial or by setting retracting stops on the saddle. We move the cross-slide to line up each tool for a cut, then advance the saddle to feed the tool into the work. *S Taylor, Wellington, New Zealand.*

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JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

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153rd Winner:

(For May 12, '52 Issue)

A T Renson

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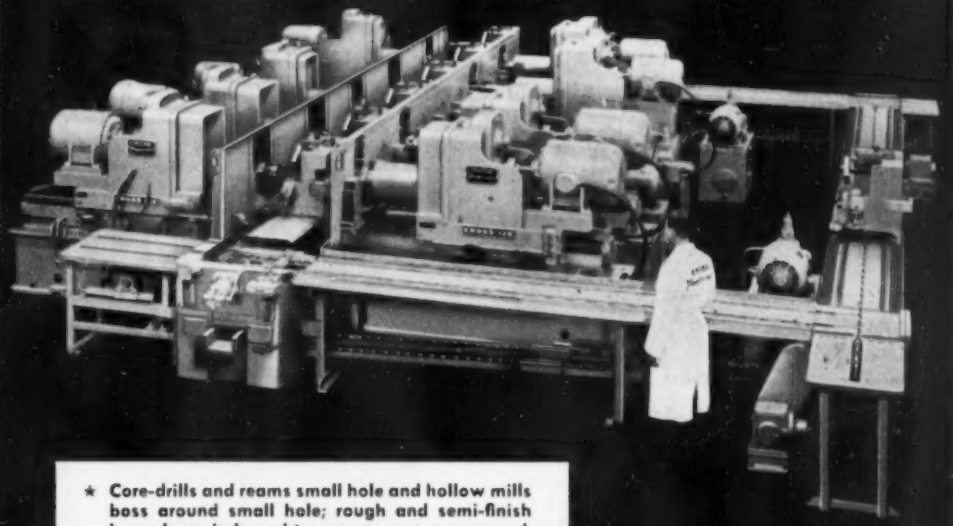

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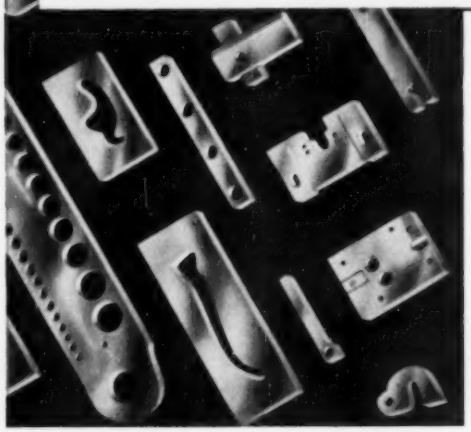

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Pin Measurement Tables for Involute Gears...VI

DIMENSION OVER PINS

20° PA tables are used for stub teeth as well as full-depth 20° teeth. Also, calculations may not be exact in the fourth decimal place, because readings were taken from the calculating machine at that point, without interpolation.

ACTUAL PIN DIAMETER — 0.12343 14 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.8814	0.8817	47	3.5319	3.5286	84	6.1789	6.1744
11	0.9451	0.9452	48	3.6054	3.6019	85	6.2493	6.2448
12	1.0255	1.0255	49	3.6751	3.6716	86	6.3218	6.3173
13	1.0905	1.0902	50	3.7484	3.7449	87	6.3923	6.3878
14	1.1696	1.1691	51	3.8181	3.8146	88	6.4648	6.4602
15	1.2354	1.2347	52	3.8914	3.8878	89	6.5352	6.5307
16	1.3134	1.3126	53	3.9612	3.9576	90	6.6077	6.6031
17	1.3798	1.3789	54	4.0344	4.0308	91	6.6782	6.6736
18	1.4570	1.4560	55	4.1043	4.1006	92	6.7505	6.7460
19	1.5240	1.5228	56	4.1774	4.1737	93	6.8211	6.8165
20	1.6006	1.5992	57	4.2474	4.2436	94	6.8935	6.8889
21	1.6680	1.6665	58	4.3204	4.3166	95	6.9640	6.9594
22	1.7440	1.7425	59	4.3904	4.3866	96	7.0364	7.0318
23	1.8118	1.8101	60	4.4634	4.4596	97	7.1070	7.1023
24	1.8874	1.8856	61	4.5334	4.5296	98	7.1794	7.1747
25	1.9555	1.9536	62	4.6064	4.6025	99	7.2499	7.2452
26	2.0308	2.0288	63	4.6765	4.6725	100	7.3223	7.3175
27	2.0991	2.0970	64	4.7494	4.7454	101	7.3928	7.3881
28	2.1741	2.1719	65	4.8195	4.8155	102	7.4652	7.4604
29	2.2426	2.2403	66	4.8923	4.8883	103	7.5358	7.5310
30	2.3173	2.3150	67	4.9625	4.9582	104	7.6081	7.6031
31	2.3860	2.3836	68	5.0353	5.0312	105	7.6787	7.6739
32	2.4605	2.4580	69	5.1055	5.1014	106	7.7510	7.7462
33	2.5294	2.5268	70	5.1783	5.1741	107	7.8217	7.8168
34	2.6037	2.6011	71	5.2485	5.2444	108	7.8939	7.8891
35	2.6727	2.6700	72	5.3213	5.3171	109	7.9645	7.9597
36	2.7468	2.7442	73	5.3915	5.3873	110	8.0368	8.0319
37	2.8160	2.8132	74	5.4642	5.4600	111	8.1075	8.1026
38	2.8900	2.8871	75	5.5345	5.5302	112	8.1797	8.1748
39	2.9592	2.9563	76	5.6072	5.6029	113	8.2504	8.2455
40	3.0331	3.0301	77	5.6775	5.6732	114	8.3226	8.3177
41	3.1024	3.0994	78	5.7501	5.7458	115	8.3933	8.3884
42	3.1762	3.1731	79	5.8204	5.8161	116	8.4655	8.4606
43	3.2456	3.2425	80	5.8930	5.8887	117	8.5362	8.5313
44	3.3192	3.3160	81	5.9634	5.9590	118	8.6084	8.6035
45	3.3888	3.3855	82	6.0360	6.0316	119	8.6791	8.6741
46	3.4623	3.4590	83	6.1064	6.1019	120	8.7513	8.7463

ACTUAL PIN DIAMETER — 0.108 16 DP 14½° and 20° PA

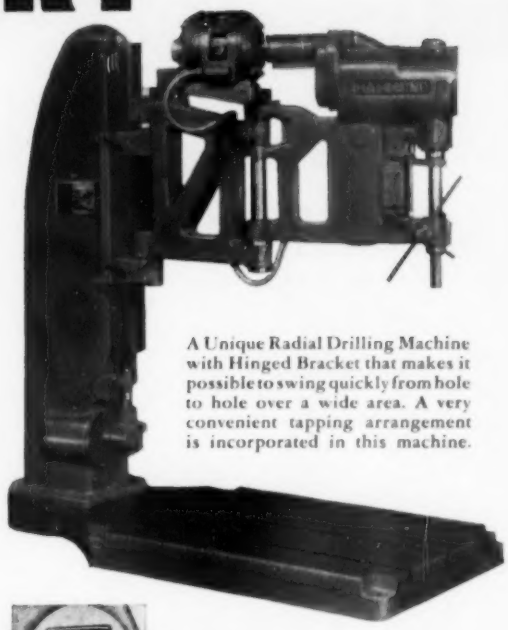
TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.7712	0.7715	47	3.0904	3.0875	84	5.4065	5.4026
11	0.8269	0.8270	48	3.1547	3.1517	85	5.4682	5.4642
12	0.8974	0.8973	49	3.2157	3.2126	86	5.5316	5.5277
13	0.9542	0.9539	50	3.2798	3.2768	87	5.5932	5.5893
14	1.0234	1.0230	51	3.3409	3.3378	88	5.6567	5.62
15	1.0809	1.0804	52	3.4050	3.4019	89	5.7183	5.7143
16	1.1492	1.1485	53	3.4661	3.4629	90	5.7817	5.7777
17	1.2073	1.2065	54	3.5301	3.5269	91	5.8434	5.8394
18	1.2749	1.2740	55	3.5913	3.5880	92	5.9068	5.9028
19	1.3335	1.3325	56	3.6552	3.6520	93	5.9685	5.9644
20	1.4005	1.3993	57	3.7164	3.7131	94	6.0318	6.0278
21	1.4595	1.4582	58	3.7804	3.7770	95	6.0935	6.0895
22	1.5260	1.5247	59	3.8416	3.8383	96	6.1569	6.1528
23	1.5853	1.5838	60	3.9055	3.9021	97	6.2186	6.2145
24	1.6515	1.6499	61	3.9668	3.9634	98	6.2819	6.2778
25	1.7110	1.7094	62	4.0306	4.0272	99	6.3437	6.3396
26	1.7769	1.7752	63	4.0919	4.0884	100	6.4070	6.4029
27	1.8367	1.8349	64	4.1557	4.1522	101	6.4687	6.4646
28	1.9023	1.9004	65	4.2170	4.2135	102	6.5320	6.5279
29	1.9622	1.9603	66	4.2808	4.2773	103	6.5938	6.5896
30	2.0276	2.0256	67	4.3422	4.3386	104	6.6571	6.6529
31	2.0877	2.0856	68	4.4059	4.4023	105	6.7189	6.7147
32	2.1529	2.1508	69	4.4673	4.4637	106	6.7821	6.7779
33	2.2132	2.2110	70	4.5310	4.5273	107	6.8439	6.8397
34	2.2782	2.2759	71	4.5924	4.5888	108	6.9072	6.9029
35	2.3386	2.3362	72	4.6561	4.6524	109	6.9690	6.9647
36	2.4035	2.4011	73	4.7175	4.7138	110	7.0322	7.0280
37	2.4640	2.4615	74	4.7811	4.7774	111	7.0940	7.0897
38	2.5287	2.5262	75	4.8426	4.8389	112	7.1572	7.1530
39	2.5893	2.5867	76	4.9062	4.9025	113	7.2191	7.2148
40	2.6539	2.6513	77	4.9677	4.9640	114	7.2823	7.2780
41	2.7146	2.7120	78	5.0313	5.0275	115	7.3441	7.3398
42	2.7791	2.7764	79	5.0928	5.0890	116	7.4073	7.4030
43	2.8399	2.8371	80	5.1564	5.1526	117	7.4692	7.4649
44	2.9043	2.9015	81	5.2180	5.2141	118	7.5324	7.5280
45	2.9652	2.9623	82	5.2815	5.2776	119	7.5942	7.5899
46	3.0295	3.0266	83	5.3431	5.3392	120	7.6547	7.6530

FOOTBURT

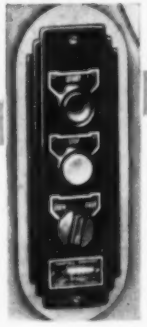
machine tools for increased production

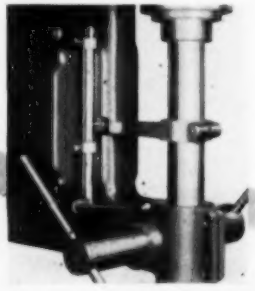
engineered for production

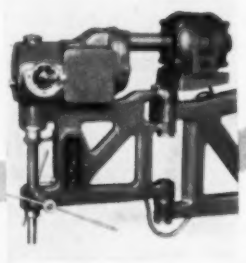
Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.



A Unique Radial Drilling Machine with Hinged Bracket that makes it possible to swing quickly from hole to hole over a wide area. A very convenient tapping arrangement is incorporated in this machine.







THE FOOTE-BURT COMPANY, Cleveland 8, Ohio

Detroit Office: General Motors Building

FOOTBURT

machine tools

Pin Measurement Tables for Involute Gears...VII

(BASED ON 1.728 SERIES OF PINS)

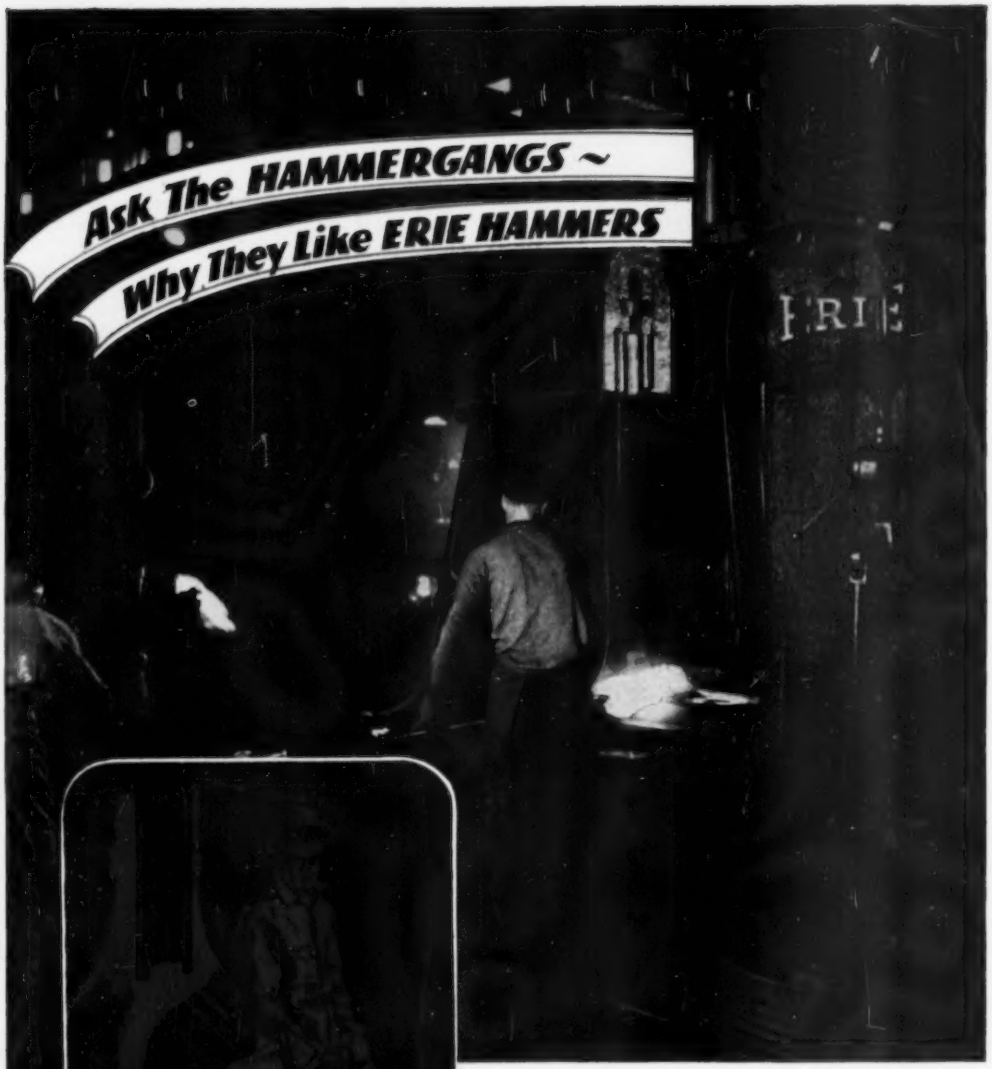
BY RALPH E RAWLING, President, RAWLING GEAR WORKS, INC, WORCESTER, MASS.

ACTUAL PIN DIAMETER — 0.096 18 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.6855	0.6858	47	2.7470	2.7444	84	4.8058	4.8023
11	0.7350	0.7351	48	2.8041	2.8015	85	4.8606	4.8571
12	0.7977	0.7976	49	2.8584	2.8557	86	4.9170	4.9135
13	0.8482	0.8479	50	2.9154	2.9127	87	4.9718	4.9683
14	0.9095	0.9093	51	2.9697	2.9669	88	5.0282	5.0246
15	0.9608	0.9603	52	3.0266	3.0239	89	5.0830	5.0794
16	1.0215	1.0209	53	3.0809	3.0781	90	5.1393	5.1358
17	1.0732	1.0725	54	3.1379	3.1350	91	5.1941	5.1906
18	1.1332	1.1324	55	3.1922	3.1894	92	5.2505	5.2469
19	1.1853	1.1844	56	3.2491	3.2462	93	5.3053	5.3017
20	1.2449	1.2438	57	3.3035	3.3006	94	5.3616	5.3580
21	1.2973	1.2962	58	3.3603	3.3574	95	5.4165	5.4129
22	1.3565	1.3552	59	3.4147	3.4118	96	5.4728	5.4692
23	1.4092	1.4079	60	3.4715	3.4685	97	5.5277	5.5240
24	1.4680	1.4666	61	3.5260	3.5230	98	5.5840	5.5803
25	1.5209	1.5195	62	3.5827	3.5797	99	5.6388	5.6352
26	1.5795	1.5779	63	3.6372	3.6342	100	5.6951	5.6914
27	1.6326	1.6310	64	3.6939	3.6908	101	5.7500	5.7463
28	1.6909	1.6892	65	3.7485	3.7454	102	5.8063	5.8026
29	1.7442	1.7425	66	3.8051	3.8020	103	5.8612	5.8574
30	1.8023	1.8005	67	3.8597	3.8565	104	5.9174	5.9137
31	1.8558	1.8539	68	3.9163	3.9131	105	5.9723	5.9686
32	1.9137	1.9118	69	3.9709	3.9677	106	6.0286	6.0248
33	1.9673	1.9653	70	4.0275	4.0243	107	6.0835	6.0797
34	2.0251	2.0230	71	4.0821	4.0789	108	6.1397	6.1359
35	2.0788	2.0767	72	4.1387	4.1354	109	6.1946	6.1909
36	2.1364	2.1343	73	4.1934	4.1901	110	6.2509	6.2471
37	2.1902	2.1880	74	4.2499	4.2466	111	6.3058	6.3020
38	2.2477	2.2455	75	4.3046	4.3012	112	6.3620	6.3582
39	2.3016	2.2993	76	4.3611	4.3577	113	6.4170	6.4131
40	2.3590	2.3567	77	4.4158	4.4124	114	6.4731	6.4693
41	2.4130	2.4105	78	4.4722	4.4689	115	6.5281	6.5243
42	2.4703	2.4679	79	4.5270	4.5236	116	6.5843	6.5804
43	2.5244	2.5219	80	4.5834	4.5800	117	6.6393	6.6354
44	2.5816	2.5791	81	4.6382	4.6347	118	6.6954	6.6916
45	2.6357	2.6332	82	4.6947	4.6912	119	6.7504	6.7466
46	2.6929	2.6903	83	4.7494	4.7459	120	6.8066	6.8027

ACTUAL PIN DIAMETER — 0.0865 20 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.6169	0.6172	47	2.4723	2.4700	84	4.2752	4.2221
11	0.6615	0.6616	48	2.5237	2.5213	85	4.3745	4.3714
12	0.7179	0.7178	49	2.5725	2.5701	86	4.4253	4.4221
13	0.7633	0.7631	50	2.6239	2.6214	87	4.4746	4.4714
14	0.8187	0.8184	51	2.6727	2.6702	88	4.5253	4.5222
15	0.8647	0.8643	52	2.7240	2.7215	89	4.5747	4.5715
16	0.9193	0.9188	53	2.7728	2.7703	90	4.6254	4.6222
17	0.9659	0.9652	54	2.8241	2.8215	91	4.6747	4.6715
18	1.0199	1.0192	55	2.8730	2.8704	92	4.7254	4.7222
19	1.0668	1.0660	56	2.9242	2.9216	93	4.7748	4.7716
20	1.1204	1.1195	57	2.9731	2.9705	94	4.8255	4.8222
21	1.1676	1.1666	58	3.0243	3.0216	95	4.8748	4.8716
22	1.2208	1.2197	59	3.0733	3.0706	96	4.9255	4.9222
23	1.2682	1.2671	60	3.1244	3.1217	97	4.9749	4.9716
24	1.3212	1.3199	61	3.1734	3.1707	98	5.0256	5.0223
25	1.3688	1.3675	62	3.2245	3.2217	99	5.0749	5.0716
26	1.4215	1.4201	63	3.2735	3.2707	100	5.1256	5.1223
27	1.4693	1.4679	64	3.3245	3.3218	101	5.1750	5.1717
28	1.5218	1.5203	65	3.3736	3.3708	102	5.2256	5.2223
29	1.5698	1.5682	66	3.4246	3.4218	103	5.2750	5.2717
30	1.6221	1.6205	67	3.4737	3.4709	104	5.3257	5.3223
31	1.6702	1.6685	68	3.5247	3.5218	105	5.3751	5.3717
32	1.7223	1.7206	69	3.5738	3.5218	106	5.4257	5.4223
33	1.7705	1.7688	70	3.6248	3.6219	107	5.4751	5.4718
34	1.8226	1.8207	71	3.6739	3.6710	108	5.5257	5.5223
35	1.8709	1.8690	72	3.7248	3.7219	109	5.5752	5.5718
36	1.9228	1.9208	73	3.7740	3.7711	110	5.6258	5.6224
37	1.9712	1.9692	74	3.8249	3.8219	111	5.6752	5.6718
38	2.0230	2.0209	75	3.8741	3.8711	112	5.7258	5.7224
39	2.0714	2.0694	76	3.9250	3.9220	113	5.7753	5.7718
40	2.1231	2.1210	77	3.9742	3.9712	114	5.8258	5.8224
41	2.1717	2.1696	78	4.0251	4.0220	115	5.8753	5.8719
42	2.2233	2.2211	79	4.0743	4.0713	116	5.9259	5.9224
43	2.2719	2.2697	80	4.1251	4.1220	117	5.9753	5.9719
44	2.3235	2.3212	81	4.1744	4.1713	118	6.0259	6.0224
45	2.3721	2.3699	82	4.2252	4.2221	119	6.0754	6.0719
46	2.4236	2.4213	83	4.2745	4.2714	120	6.1259	6.1224



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ERIE BUILDS *Dependable* HAMMERS

Pin Measurement Tables for Involute Gears...VIII

ACTUAL PIN DIAMETER — 0.072 24 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.5141	0.5143	47	2.0603	2.0583	84	3.6044	3.6018
11	0.5513	0.5513	48	2.1031	2.1011	85	3.6454	3.6428
12	0.5982	0.5982	49	2.1438	2.1417	86	3.6877	3.6851
13	0.6361	0.6359	50	2.1865	2.1845	87	3.7288	3.7262
14	0.6822	0.6820	51	2.2272	2.2252	88	3.7711	3.7685
15	0.7206	0.7202	52	2.2700	2.2679	89	3.8122	3.8096
16	0.7661	0.7657	53	2.3107	2.3086	90	3.8545	3.8518
17	0.8049	0.8043	54	2.3534	2.3513	91	3.8956	3.8929
18	0.8499	0.8493	55	2.3942	2.3920	92	3.9379	3.9351
19	0.8890	0.8883	56	2.4368	2.4346	93	3.9790	3.9763
20	0.9336	0.9329	57	2.4776	2.4754	94	4.0212	4.0185
21	0.9730	0.9721	58	2.5202	2.5180	95	4.0624	4.0597
22	1.0173	1.0164	59	2.5611	2.5588	96	4.1046	4.1019
23	1.0569	1.0559	60	2.6036	2.6014	97	4.1457	4.1430
24	1.1010	1.0999	61	2.6445	2.6422	98	4.1880	4.1852
25	1.1407	1.1396	62	2.6870	2.6848	99	4.2291	4.2264
26	1.1846	1.1834	63	2.7279	2.7256	100	4.2713	4.2686
27	1.2244	1.2232	64	2.7704	2.7681	101	4.3125	4.3097
28	1.2682	1.2669	65	2.8113	2.8090	102	4.3547	4.3519
29	1.3081	1.3068	66	2.8538	2.8515	103	4.3959	4.3931
30	1.3517	1.3504	67	2.8948	2.8924	104	4.4381	4.4353
31	1.3918	1.3904	68	2.9372	2.9349	105	4.4792	4.4764
32	1.4353	1.4338	69	2.9782	2.9758	106	4.5214	4.5186
33	1.4754	1.4740	70	3.0206	3.015	107	4.5626	4.5598
34	1.5188	1.5173	71	3.0616	3.0592	108	4.6048	4.6020
35	1.5591	1.5575	72	3.1040	3.1016	109	4.6460	4.6432
36	1.6023	1.6007	73	3.1450	3.1425	110	4.6881	4.6853
37	1.6426	1.6410	74	3.1874	3.1849	111	4.7293	4.7265
38	1.6858	1.6841	75	3.2284	3.2259	112	4.7715	4.7686
39	1.7262	1.7245	76	3.2708	3.2683	113	4.8127	4.8099
40	1.7693	1.7675	77	3.3118	3.3093	114	4.8549	4.8520
41	1.8097	1.8080	78	3.3542	3.3517	115	4.8961	4.8932
42	1.8527	1.8509	79	3.3952	3.3927	116	4.9382	4.9353
43	1.8933	1.8914	80	3.4376	3.4351	117	4.9794	4.9766
44	1.9362	1.9343	81	3.4787	3.4761	118	5.0216	5.0187
45	1.9768	1.9749	82	3.5210	3.5184	119	5.0628	5.0599
46	2.0197	2.0177	83	3.5620	3.5595	120	5.1049	5.1020

ACTUAL PIN DIAMETER — 0.054 32 DP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.3856	0.3857	47	1.5452	1.5437	84	2.7033	2.7013
11	0.4134	0.4135	48	1.5773	1.5758	85	2.7341	2.7321
12	0.4487	0.4486	49	1.6078	1.6063	86	2.7658	2.7638
13	0.4771	0.4769	50	1.6399	1.6384	87	2.7966	2.7946
14	0.5117	0.5115	51	1.6704	1.6689	88	2.8283	2.8264
15	0.5404	0.5402	52	1.7025	1.7009	89	2.8592	2.8572
16	0.5746	0.5742	53	1.7330	1.7314	90	2.8909	2.8889
17	0.6036	0.6032	54	1.7650	1.7634	91	2.9217	2.9197
18	0.6374	0.6370	55	1.7956	1.7940	92	2.9534	2.9514
19	0.6667	0.6662	56	1.8276	1.8260	93	2.9842	2.9822
20	0.7002	0.6996	57	1.8582	1.8565	94	3.0159	3.0139
21	0.7297	0.7291	58	1.8902	1.8885	95	3.0468	3.0447
22	0.7630	0.7623	59	1.9208	1.9191	96	3.0784	3.0764
23	0.7926	0.7919	60	1.9527	1.9510	97	3.1093	3.1073
24	0.8257	0.8249	61	1.9834	1.9817	98	3.1410	3.1389
25	0.8555	0.8547	62	2.0153	2.0136	99	3.1718	3.1698
26	0.8884	0.8876	63	2.0459	2.0442	100	3.2035	3.2014
27	0.9183	0.9174	64	2.0778	2.0761	101	3.2344	3.2323
28	0.9511	0.9502	65	2.1085	2.1067	102	3.2660	3.2639
29	0.9811	0.9801	66	2.1404	2.1386	103	3.2969	3.2948
30	1.0138	1.0128	67	2.1711	2.1693	104	3.3285	3.3264
31	1.0438	1.0428	68	2.2029	2.2201	105	3.3594	3.3573
32	1.0764	1.0754	69	2.2336	2.2318	106	3.3911	3.3890
33	1.1066	1.1055	70	2.2655	2.2636	107	3.4220	3.4199
34	1.1391	1.1379	71	2.2962	2.2944	108	3.4536	3.4515
35	1.1693	1.1681	72	2.3280	2.3262	109	3.4845	3.4824
36	1.2017	1.2005	73	2.3587	2.3569	110	3.5161	3.5140
37	1.2320	1.2307	74	2.3905	2.3887	111	3.5470	3.5449
38	1.2643	1.2631	75	2.4213	2.4194	112	3.5786	3.5765
39	1.2946	1.2933	76	2.4531	2.4512	113	3.6095	3.6074
40	1.3269	1.3256	77	2.4838	2.4820	114	3.6411	3.6390
41	1.3573	1.3560	78	2.5156	2.5137	115	3.6721	3.6699
42	1.3895	1.3882	79	2.5464	2.5445	116	3.7037	3.7015
43	1.4199	1.4185	80	2.5782	2.5763	117	3.7346	3.7324
44	1.4521	1.4507	81	2.6090	2.6071	118	3.7662	3.7640
45	1.4826	1.4811	82	2.6090	2.6388	119	3.7971	3.7949
46	1.5147	1.5133	83	2.6407	2.6696	120	3.8287	3.8265

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Go to your Armco Distributor for sound advice on the selection of a stainless steel. He knows his stainless, and is backed up by Armco's many years of experience. Besides, he can supply you with Armco booklets on all phases of stainless fabrication. Just name your problem!

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TALKING SHOP

Hairspring "Glued"

ELGIN WATCH has at long last avoided the stressing of hairsprings where they were pinned to a collet or "spool", then trued by bending. With the new method, the spring end is slipped into a slot containing a metal-bonding adhesive, the spring is trued, and the abrasive allowed to set. Among problems involved was development of the world's smallest "eyedropper" to make certain that enough, but not too much, adhesive is applied to the slot. The slot is only about 0.003 in. wide, so a teaspoonful of adhesive supplies an operator for a week.

Nickel Saver

CHROME PLATING directly over white brass avoids the necessity for preplating with nickel, according to Lawrence J. Hay, vice-chairman of the Chicago Electroplaters Institute. White brass and chrome are readily available, nickel is not.

Glass Stretch

LUTHER MEADOR of the El Segundo, Calif., plant of Douglas Aircraft, has recently been awarded $150 in the suggestion contest. His idea: use glass-laminated plastic for distorted stretch-press dies.

Ti Fire

WESTINGHOUSE has built and tested a number of titanium compressor disks for turbojets. First problem (for duPont, supplier of the material) was to produce 360-lb ingots. Graphite crucibles allowed the titanium to pick up about 1%C, which created a dendritic structure of TiC. Unless these carbides were broken up in forging, the structure would be brittle. Changes in casting methods improved ductility, but at the cost of other properties.

Low-temperature forging and cold working increased strength somewhat, but alloyed compressor disks are more satisfactory all around.

From the original Ti billets, Westinghouse forged 300-lb. "pancake" disks, which were then machined. During automatic grinding of the curvic coupling on one disk, the intensely hot sparks produced (see *AM* cover, June 11, 1951) set fire to oily dust in the machine, and both disk and machine were destroyed.

Stop and Think!

WORD HAS COME to us that the Communist Party in America has received orders from Moscow to increase the work-stoppage program. A recent survey at one of our largest industrial plants showed that work stoppages had increased ten times over the last two years. The reasons are always petty: insufficient toilet tissue in bathrooms, not enough time for wash-up, too many draughts, and countless other minor complaints. Instead of requesting that management correct the supposed fault, all work stops. Most of the people who take part in these setbacks to our defense program are not aware that they are being used to defeat themselves. Have you measured the work stoppages in your plant lately?

Home Shaves

THERE IS A SIMPLE RULE by which the US Customs prevents the importation of foreign-made razor blades. All imported knives, scissors, and other cutlery must have the full name of the manufacturer and the country of origin die-stamped on each blade. Imported razor blades cannot be die-stamped without breaking.

Self-Tapped

TODAY, we hear, 25% of all machine screws are of the self-tapping variety —a development of the last ten years. Now the screw does its own tapping, under power of a portable tool.

Space Engineering

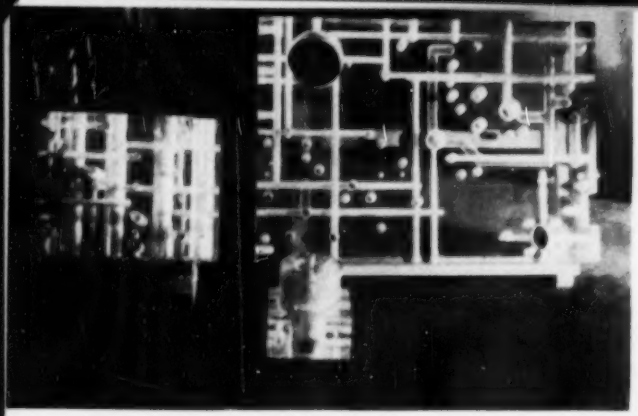
TO WRAP a cubic inch of space with 2 in. of armor takes 31 lb of steel. That's why "space engineering" is so important in developing combat vehicles such as tanks. Obviously, the added inch isn't going to add 31 lb, but it is going to add something —and weight that doesn't protect or fight is just costly in power and maneuverability.

Solid-Dot Braille

A BRITISH COMPANY has just shown a new type of Braille printer—on the 100th anniversary of the discovery of this method of printing for the blind. It combines electronics, plastics, and process printing. First, a 3-fingered electronic unit "reads" Braille dots from a page, actuating a slave machine that punches holes in a stencil. A new plastic ink is then squeezed through the stencil onto both sides of paper and infrared cured to fix the dots. Thus stencil thickness controls dot height and punch contour controls dot shape and size. Thinner paper can be used for the printing, and the uniform dots can be read more easily than those produced now by indenting the back of thick, spongy paper. Also, wear is less, paper is cheaper and more readily available, and the stencils cost far less than present embossed metal plates.

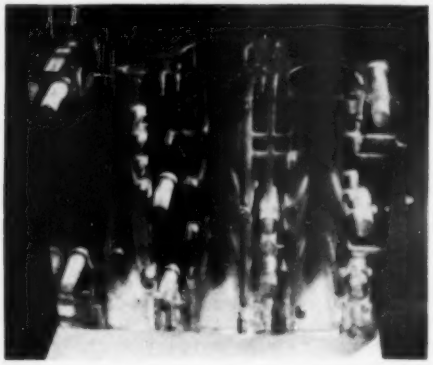
Boom!

A LARGE STEEL COMPANY has a well-known active member of the Communist Party on its payroll. Every effort to remove him has been blocked. His occupation: licensed dynamiter!



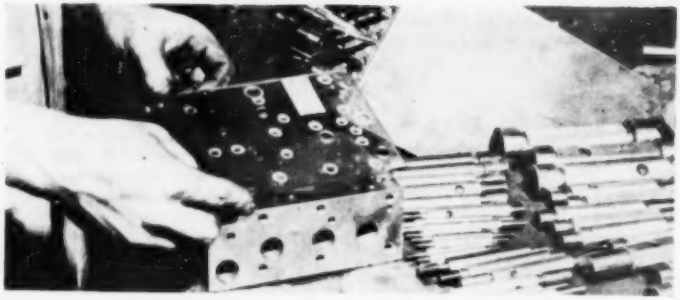
Lucite models of hydraulic manifold, combination valve body, and selector valve (for Norton Type CTU grinder) show all holes, center distances, and end locations. Solid plastic block is first ground and polished on both ends, then drilled with first lot of parts produced—using the same setup and machine

Machine-table control-valve body of Lucite will, after a careful check of all dimensions, become an engineering and inspection reference for all future lots. Blueprint errors, such as holes too close together, are revealed instantly when model is made

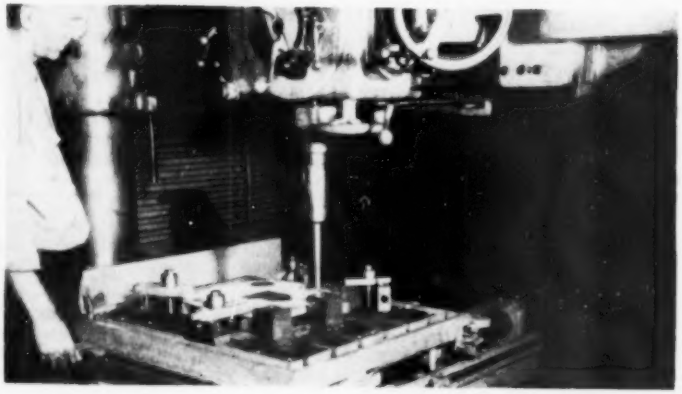


PLASTICS make inspection crystal clear

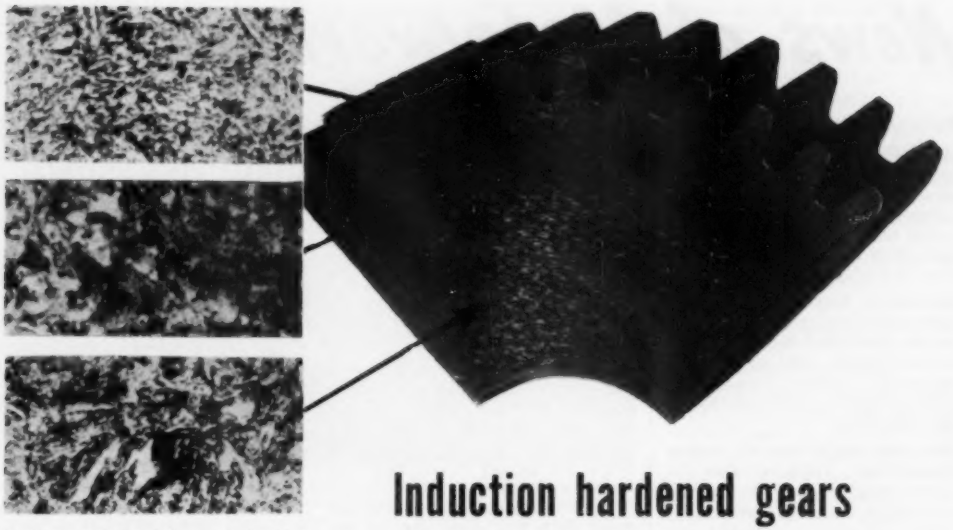
Norton grinders require hydraulic parts with as many as 167 drilled holes. To avoid poring over complicated blueprints, inspectors and operators use models of clear plastic. The models also show where engineering improvements can be made



Inspectors use thin templets of Lucite to show, at a glance, whether all holes have been drilled and are located properly. Wooden block at inspector's left contains rods marked for proper depth of hole. Colors of painted rings around holes in templet correspond to color bands on rods. Thus inspector can quickly select proper rod for hole he is checking



Most drilling and boring work at Norton is done on radials equipped with the Bullard spacer table. Tolerances are held to ± 0.0002 in. by taking all play and backlash out of spindle. **Biggest advantages of spacer** are no storage and maintenance of fixtures and no downtime while jigs and bushings are changed. File drawer of simple charts is entire Norton "inventory" for this type of work. Length of work handled is not limited by spacer-table size as long as there is a repetitive pattern of holes. Work 14 ft long has been run by reaming the last hole drilled, inserting the arbor, and calling this zero when drilling second cycle of holes



Hardness penetration below root of teeth is approximately ¼ in. Original structure of blank (bottom) heat treated to 20-26 R_c, transition zone (center) with hardness of 36-42 R_c, and tooth structure (top) after tempering to 48-50 R_c. All specimens 1000X with 2% nital etch

Induction hardened gears show little distortion

BY L G MILLER, chief metallurgist, GREENLEE BROS & CO

ALTHOUGH the versatility and importance of induction heating have been thoroughly established, the process does have certain limitations. While it is the answer to many production problems, there are cases in which no cost or time savings can be realized. Proposed applications, therefore, should be carefully investigated before being adopted.

Greenlee Bros & Co manufacture an unusually large variety of gears for their machine tools, including spur, bevel, and helical types. Most are made from a through-hardening, 0.50% carbon, chrome-moly type, and about 90% of these lie in the range of 8, 8-10, and 10 pitch. A few, with wear requirement as a prime factor over strength, are made from a carburizing alloy steel. Bores are either straight with a keyway, or splined. The short production runs and the variety of setups make automatic work handling impracticable, so all gears are handled manually.

Gear blanks are rough turned, heat treated to R.26, finish turned, broached, hobbed, shaved, then forwarded to the heat-treat department. A work coil is selected to suit the diameter, and the setting and time cycle are adjusted according to experience gained on similar parts. The gear is placed on an adjustable work support to center it in the heating coil. The cycle is set to form a heat pattern to a point about ¼ in. below the root of the teeth, although this depth will vary slightly with gear size. At the end of the cycle, power is shut off automatically, and the part quenched manually. After cooling, the part is vapor degreased and tempered to R.48-50 in an air-circulating draw furnace.

Depth of penetration was determined by experiments on the strength of the teeth. Our gearing is subject to considerable shock, yet must have some wear resistance at the pitch line. Tests made with a hardness of R.26 at the root, and high hardness at the pitch line, showed early failure because of fatigue at the root. Penetration below the root at R.48-50 gave the necessary strength at the stress point, which is at the root. This hardness showed suitable wear resistance, so became standard.

Distortion is held to a minimum with this treatment. There may be from 0.0002 to 0.003-in. distortion at the pitch line, depending on the size and shape of the gear, but this is small enough not to be objectionable, and no further work is performed at the PD.

The bore may be from 0.000 to 0.003 in. small. Not all bores change, and those with splined holes show almost no movement, but we re-broach all bores after heat treatment, for uniformity, and also to insure concentricity of bore and pitch line.

Our equipment is an Allis-Chalmers, vacuum-tube-type heater rated at 50 kw at 400,000 kc. Working with such high power, and because there is no temperature control, special care must be taken in setting up the power output and time cycle. A setup man familiar with elevated temperatures is appointed to set up the various jobs; automatic controls then handle the work without further attention.

News of Metalworking

Metalworking Abroad

(By McGraw-Hill World News)

Bently Ups Speed 20%—a new 4½-liter Bently sports car, taking advantage of light-alloy body and higher rear-axle ratio, turns up 120 mph. Auto is built for limited export by Mulliners.

Hawker to Australia—If government support is forthcoming, Hawker Siddley plans expanding gas-turbine repair and maintenance operations to South Australia, then moving engine and airframe manufacturing there.

Turin Fair Starts Sept 27—Second International Technical Fair at Turin, Italy, will include exhibits of machine tools, metallurgy, electrical appliances, and machinery. Italian Navy participates, too.

India Considers Import Ban—Makers of diesel engines in India, particularly of under 10 hp, are pushing for severe restrictions to aid their domestic sales. Decline of commodity prices has hit all Indian manufacturing.

Greek Tractor Orders—Believed the largest single import license ever granted in Greece, an order for £ 140,000 worth of Ferguson tractors has been granted to Batex.

Fringe Benefits Cost 30c Per Hour Study of Cleveland Industries Shows

CLEVELAND—Average manufacturer here employing 1000 or more people spends 30¢ per hr on fringe benefits such as insurance, pensions, vacations, holidays, and the like. Cost to small companies for these benefits has gone up proportionately.

- More companies are paying time-and-a-half for Saturdays and double-time for Sundays, rather than for the sixth day and seventh day worked. Only a small minority of firms are paying triple time for work on holidays.
- Hourly differential for second and third shifts has risen, with 7¢ per hr for the second and 10¢ for the third not uncommon.
- Many companies have adopted an escalator plan for vacations, the system working like this: 3 (working) days for six-months' service; 5 days for one year; 6 days for two years; 7 days for three years; 8 days for four years; 10 days for five years. Ten working days is regarded as maximum.

312 FIRMS GIVE DATA—These practices are revealed in the 1952 Labor-Management Relations Handbook published by the Associated Industries of Cleveland. Some 312 Cleveland area manufacturers contributed data to this study. Their payrolls represent almost three-fourths of the city's industrial workforce. The Handbook, which may be purchased by out-of-Ohio companies, is a guide for Cleveland firms to pin-point industrial relations practices and to follow trends.

The Handbook has the following to say on these subjects:

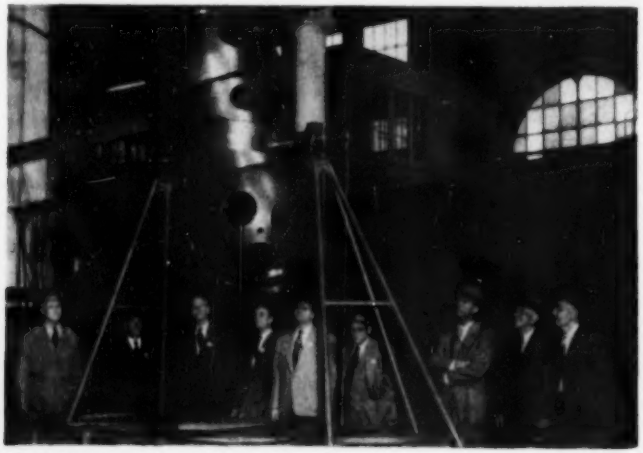
Improvement Factor — Only 63 companies have agreed to tie wages to cost of living on a formal basis. Most of them are large plants. The improvement factor has been accepted by only 27 companies, of which the majority employ over 1000.

Vacations — Eligibility requirements have been eased as result of company custom of closing simultaneously with employee vacations and of union pressure. 84 firms give vacations (generally 3 days) to workers with less than a year's seniority. Unions have had little success in securing three-weeks' vacation.

Holidays—The standard six holidays still hold. But the rule that an employee has to work the day before and the day after a holiday has been relaxed. Now he must be at work during the week in which the holiday falls. 191 firms pay for a holiday if it comes in a worker's vacation period.

Insurance—Group life insurance protection is provided by 222 firms—134 companies on a contributory basis, 77 companies paying total cost. Only 14 or 4.6% of the companies do not include insurance benefit. But many small firms provide only the administrative machinery and the worker pays the full cost.

Pensions—The pension arrangement is basically a large company practice. But companies giving work to more than 1000 people are falling into line, and the heat is on those managements in the 500 to 1000-worker class. Pension benefits are based on length of service plus earnings as a general rule, and provide from $50 to $150 a month.



Planetarium-projector casting, drive mechanism, supports, and foundation for installation at Morrison Planetarium are inspected by officials of Bethlehem Pacific Coast Steel Corp and California Academy of Science. This is the first projector to be made outside of Jena, Germany

Apprentice program has been launched by Herman Pfauter Machine Tool Works, assuring a steady supply of skilled labor to augment the old faithful employees who followed Pfauter from East to West Zone of Germany. Twenty-five young German apprentices are now embarked on a three-year course in the Ludwigsburg Factory. At the same time, five "commercial" apprentices are learning the business aspects of the machine-tool industry

What—Canned Clothes?

DAYTON — Air-tight black-iron drums, replacing corrugated and wooden cases, ship service clothing better and cheaper, according to Air Materiel Command at Wright-Patterson AFB, here. Clothing received overseas during tests came through in better condition, and receivers expressed a marked preference for the new idea in packaging. Drums are 20 gage, in 15-, 30-, and 58-gallon sizes, heavily coated inside with lacquer.

France Gets 1.5 Million For Powered Hand Tools

WASHINGTON — A special allotment of $1.5 million in American defense-support funds will go mainly for electric and pneumatic power tools purchased in US for delivery to France. Allotment is in addition to $270 million made available to France by Mutual Security Agency for fiscal 1952.

Tool Builder, Grabbed by Russians, Sets Up Shop in West

FRANKFURT (McGraw-Hill World News)—Export statistics continue to tell a story of boom conditions in the German machine-tool industry, with shipments abroad continuing the upward move reported in *AM* April 14 (p 194). But the statistics don't tell the dramatic story of trials experienced in making possible this boom—like experiences of the many builders caught over in the Russian zone, and their efforts to smuggle equipment and personnel into the Western zone to re-establish on a lesser scale their pre-war operations.

The lot of these emigré firms has not been an easy one. Fairly representative of these manufacturers is the Herman Pfauter Machine Tool Works, founded in 1900 in Chemnitz, Saxony, now in the Russian zone.

By 1939 Pfauter employed over 900 people and the plant covered more than four acres. The end of the war found Pfauter with an undamaged plant, 1200 employees, and six acres of plant space. In 1945, however, the plant was totally dismantled, and in 1947 the firm was expropriated. In 1949, entry of the firm in the Chemnitz Commercial Register was officially cancelled.

PFAUTER REBORN—In 1949, three sons of the original founder made another start, armed with not much more than blueprints and government credit. Pfauter Machine Tool Works was started up again in a former German army barracks at Kornwestheim, near Stuttgart. Production of most of the pre-war models was resumed here.

In 1951, the army barracks reverted to their original purpose and Pfauter had to move once more. This time the firm settled in what is its present location at Ludwigsburg, Stuttgart, where a modern, streamlined plant has now been erected. Today, over 330 workers are again employed by Pfauter.

Sales in 1951 of Pfauter hobbing machines and hobs totaled DM 51.5 million, with 60% of production earmarked for export. Pfauter's chief customers were Australia, India, Hong Kong, South Africa, England, France, Italy, Switzerland and the Scandinavian countries.

Pfauter now enjoys a cooperative production arrangement with two other firms who also produce Pfauter machine tools: Frieseke & Hoepfner, at Erlangen-Bruck, and Berliner Maschinenbau AG., formerly Schwartzkopff, Berlin.

Thus far, no Pfauter machine tools have been exported to the US, but Pfauter has sent a model to the Chicago Machine Tool Exhibit in March and has been negotiating for American representation.

INCREASE OUTPUT—Delivery dates at Pfauter now stand at 15 months for domestic sales and at a 12 months maximum for export orders. The firm's backlog of orders stands at approximately one year's production. Pfauter expects to raise production in 1952 by 20 percent over 1951.

To get back into business, Pfauter had to go heavily into debt. The German government has granted two loans: The first loan for DM 1.3 million went for reconstruction at Kornwestheim: A second loan for $1.1 million helped raise the present plant at Ludwigsburg. ECA granted a total of DM 200,000 in counterpart funds for the purchase of necessary machinery at both Kornwestheim and Ludwigsburg.

The Pfauter plant is now unionized up to 70% of the labor force. Thus far, relations between management and union have been cordial and satisfactory. Codetermination, bugaboo of the steel and iron industry, has not yet hit the machine-tool industry.

The Pfauter program is based primarily on regular pre-war designs, plus a few post-war refinements and special attachments to the hobbing machines. No new radical deviations from standard models are planned.

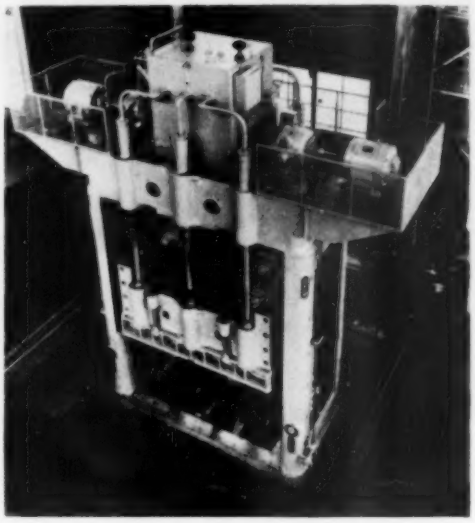
HPM Marks 75th Year With Record Output

MOUNT GILEAD, O—Production and profits of Hydraulic Press Mfg Co should set a new record this year, according to John C Cotner, president of the company. First-quarter shipments ran to $3,223,105, compared with $1,970,760 for last year's first quarter.

In celebrating its 75th anniversary, HPM noted several important contributions to industry: The first hydraulic press, a cider press built in 1877; First self-contained automatic hydraulic press, which superseded the old water and accumulator-operated models in 1926; First commercial injection-molding press for plastic materials; and Development of preplasticizing, an important function in plastic molding.

An early radial, reversible oil pump, developed to work on a press, but later discarded, started HPM in the hydraulic-power field. Along with press developments, the company enlarged the power line to include pumps, motors, valves, boosters, power units, etc.

One of HPM's latest products is a 750-ton blankholder press (photo at right), largest ever shipped to Holland. Installation will be for Van Doorne's Automobielfabriek, at Einhoven. Press weight is 173 tons; daylight, 146 in.; stroke, 56 in.; bed size, 144 by 84 in. Ram travels at 350 ipm, but automatic slow-down cuts speed to 60 ipm for actual forming.



At present, two plants are operating; one on presses, the other on power equipment.

Production Equipment Not Yet Idle, But Steel Supply Worsens

NEW YORK—Production equipment in the nation's plants is not idle for want of metal to work, but an AMERICAN MACHINIST survey of major production centers points to a day-by-day worsening of the supply situation as the steel strike continues. Here's the picture in Cleveland, Chicago, and West Coast areas:

CLEVELAND — Plans with defense contracts here are not hurt yet. Some are still operating normally after five weeks of stoppage. Cadillac Tank is a prime example, and that plant uses steel in big quantities.

Some metalworking plants that shut down completely three or four weeks ago have reopened on a curtailed basis. For instance, Midland Steel Products called back about 25% of its factory force; Ford Motor called back its full force at both foundry and engine plants for a three-day work week last week. Bendix Home Appliance of Avco, at Clyde, Ohio, is back turning out washers and dryers.

But the strike is having a serious effect on many plants without defense contracts. They are curtailing operations by shortening the work week to two and three days, or are working short-handed by staggering personnel.

Companies tied in with the plane makers are not only operating normally but continue to expand. Thompson Products is still hiring, particularly skilled help. Same goes for Pesco, Cleveland Pneumatic Tool, Jack & Heintz, and Parker Appliance.

The Clarkwood Road plant of Thompson, with 3000 employed there on auto parts, goes down for two weeks July 28. Unless the strike is over and steel supplies assured before the end of the vacation period, a large number of the 3000 will be furloughed.

CHICAGO — A leading company here last week went to a four-day week in automotive-products departments, and future schedules are uncertain. This cutback is because of hold orders from customers, rather than from supply shortage.

A farm-equipment manufacturer has furloughed 50,000 workers until the steel strike is over and steel is again available. A few minor departments still are operating in a few closed plants. Work on ordnance vehicles is continuing, but at reduced rate.

Caterpillar tractor closed July 3 for regularly scheduled vacation, reopens July 21. Operation schedules were maintained up to vacation shutdown. The company plans to get additional steel through conversion when mills resume work.

An appliance manufacturer shut down all civilian production June 23, will remain closed until steel is available. The firm's defense-production lines in Milwaukee and Chicago still are operating.

A conveyor manufacturer reports about 30 days of steel on hand at most plants, although inability to get alloy steels forced vacation shutdown at two other plants.

WEST COAST — Metalworking firms in San Francisco generally have inventory enough to keep going until end of July. After that there'll be extensive shutdowns.

Los Angeles-area firms have still not felt the steel strike to any great degree. Estimates on when the pinch will get serious range from two weeks to early September. Stocks on hand, en route, and in warehouses, plus production of unstruck mills, have carried most manufacturers to date.

Outlook Bright for Labor Peace In Metalworking Industries

WASHINGTON—There's more labor trouble ahead, but it won't be as bad as what the country already has gone through in the oil, steel, and other big strikes.

A number of factors make the outlook for labor peace in metalworking bright. Most important is the long steel strike. It helped set a pattern for wage and fringe benefits, and served as the big test on the controversial union-shop issue. Workers laid off due to steel shortages, or who face workless days next winter when steelmakers may run out of ore, will be in no mood to strike.

Another is politics. Unions will be busy helping elect a Democratic president and a friendly 83rd Congress. They won't want to incur the ill will of the voters by striking.

CONVENTION SCHEDULED — Union conventions will take up much of the labor leaders' time, too. Some of the big ones: Sept 8, AFL in New York; Sept 15, International Association of Machinists in Kansas City; Oct 6, CIO Electrical Workers in Pittsburgh; Oct 7, United Mine Workers in Cincinnati, and Nov 17, CIO in New York.

Long-term contracts are another factor. We have them in automobiles, farm equipment, and railroads. Aluminum Co of America and the AFL aluminum workers agreed tentatively on a five-year contract, too. Others are following suit.

There is potential trouble ahead in coal and copper mining and in the electrical and aircraft industries, despite the other favorable factors. John L Lewis has played a waiting game with his United Mine Workers, and will be hard to please. The left-wing Mine, Mill, and Smelter Workers won a big raise in the copper mines last year by striking, are threatening to strike again.

General Electric and Westinghouse are putting up strong resistance against excessive wage demands, with a showdown due in late summer.

In aircraft, the IAM and CIO Auto Workers are trying to out-gain the other, making life unpleasant for aircraft management despite their no-raiding pact.

HIGHER INCREASES SOUGHT — The major union demand is for wage increases above the rise in cost of living. The BLS price index is just about where it was six months ago, so living-cost increases haven't amounted to much. Where there are cost-of-living bonuses, the unions want all or a big part of them frozen into the base rates so a drop in living costs won't wash them out completely.

Demands for increases above the cost-of-living allowance take various forms. One is the "annual improvement" or "productivity" increase of four cents an hour, a part of the General Motors contract. The Wage Stabilization Board was about to issue a regulation permitting these increases when Congress blocked it temporarily by amending the Defense Production Act. But WSB is approving these increases a number of individual cases.

Others take the form of incentive or job-evaluation plans. Then there are improved fringe benefits up to WSB's recommendations in steel, including three weeks' paid vacation after 15 years and six paid holidays.

Total package demands have been around 25 cents an hour.

Plant Expansions

• **Yale & Towne Mfg Co** will build a new lock and hardware plant at Gallatin, Tenn. Floor area will be 75,000 sq ft. Yale & Towne is also buying **American Sintered Alloys, Inc**, in exchange for stock. ASA has been a supplier of small parts to Yale & Towne, and will be operated as a supplying division.

• **Vocaline Company of America** has purchased a controlling interest in **Bristol Motor Co**, who makes synchronous motors. Vocaline will be operated as a partly owned subsidiary under new management.

• **Ford Motor Co** is increasing the size of its Georgetown Rd, Canton, O., plant about 50%. The forge plant will be expanded to provide more flexibility and capacity.

• **A O Smith Corp** has closed its Norwood Ave plant in Toledo, moving equipment and some personnel to Kankakee, Ill. The Laskey Rd plant remains unaffected.

• **White Motor Co** is building a $750,000 regional headquarters building in San Francisco. Size will be 37,000 sq ft.

• **Raytheon Mfg Co** will carry on research and manufacture equipment in a new plant at Waltham, Mass.

• **Westinghouse Electric Corp** is planning a $32-million expansion of its Lester, Pa., plant to handle production of steam turbines.

Lightweight I-beams make up first all-aluminum bridge, being built over Saguenay River at Arvida, Quebec, by Dominion Bridge Co. Span will be a single arch 504 ft long. Non-weldable alloy could not be easily corrected in case of error, so great care in hole-drilling, cutting, and joining was necessary

R S Stevenson

Carl A Salmonsen

Lester A Shea

Robert L Brehm

Names in the News

R S Stevenson has been elected executive vice president of Allis-Chalmers Mfg Co; he was previously vice president in charge of the tractor division, with which he had been associated since 1933. **Willis G Scholl**, formerly vice president and general sales manager of the division, succeeds Mr Stevenson, and **Frank Mussell**, eastern territory manager, has been named to Mr Scholl's post.

Herbert Schwartz has been named production manager of Daco Machine & Tool Co. Formerly assistant to the general manager, Mr. Schwartz has been associated with the company since 1948.

J H Cattell has been elected president of Warner-Patterson Co, Chicago, succeeding **A P Warner**, named chairman of the board. Associated with the organization for 36 years, Mr Cattell has served as secretary, general manager and treasurer.

B A Gustafson, who was elected vice president of Sundstrand Machine Tool Co, Rockford, Ill., as announced in AM July 7, p180

Carl A Salmonsen has been named acting general manager of General Electric Co's control dept at Schenectady, N. Y., replacing **Karl R Van Tassel**, recently appointed general manager of the Knolls Atomic Power Laboratory, operating dept, Schenectady. Associated with the company for 42 years, Mr. Salmonsen has been general manager of the GE industry control dept since February, and will continue in that post together with his new assignment.

Charles C Reiff has been appointed chief engineer of Rockwell Mfg Co's Barberton, Ohio, Div. **Bernard Last** has been named to suceed Mr Reiff as project engineer of the Lubrication Dept at the home office in Pittsburgh.

Richard J Schumann has been appointed vice president in charge of manufacturing of Chrysler Corp's Airtemp Div's plant at Dayton, Ohio. He had previously been factory manager in charge of all production, planning, plant engineering, master mechanics and power plant depts of the division.

Albert L Deatrick has been appointed manager of the sales dept of Magna Mill Products, South Gate, Calif. He had previously been associated with C F Braun Co, Alhambra, Calif., as machine shop supt, and during the past few years has been active in the aviation industry.

J A Hill has been appointed manager of Independent Pneumatic Tool Co's new Thor industrial sales division. **J F Corkery**, formerly sales promotion manager, succeeds Mr Hill as manager of electric tool sales. **G A Thoma** takes over Mr Corkery's post as sales promotion manager.

Lester A Shea, on leave of absence as general sales manager of Lindberg Engrg Co, Chicago, has been named Chief, Industrial Heating Equipment Section, Metalworking Equipment Div of National Production Authority. Mr Shea is a member of Lindberg's executive staff and design committee and acts as coordinator for the various company divisions.

Robert L Brehm has been appojnted assistant chief engineer of Snyder Tool & Engrg Co and its subsidiary, Arthur Colton Co. Mr. Brehm has been a member of the firm since 1940, serving in various capacities.

Joseph C Morrison has been appointed manager of General Electric's Carboloy plant in Edmore, Mich. A member of the organization since 1941, Mr Morrison moves up from the post of supt, Alnico Div.

L L Brabham has been elected a vice president of Republic Aviation Corp. Associated with the firm for the past twelve years, Mr Brabham will continue direction of the company's sales activities.

E P Cody, general sales manager, Hanson-Whitney Co, Hartford, Conn., who was made office manager of the firm, as announced in AM July 7, p180

Westinghouse Building First Atomic Submarine Engine

PITTSBURGH, Pa. — Westinghouse Electric Corp, under a joint AEC and Navy contract, is building both the nuclear reactor, or atomic "boiler," and the associated propulsion equipment for the USS Nautilus, first atomic-powered submarine. Keel-laying on June 14 occured 3½ years after the company had been assigned to build the first atomic engine.

Detail design is being carried out jointly by AEC's Argonne National Laboratory and Westinghouse. A land-based prototype, basic pattern for the unit, is being built at the National Reactor Testing Station near Arco, Idaho.

Distressed Job Areas Get Contract Awards

WASHINGTON — During the month of May, the N. Y. Quartermaster Procurement Agency awarded $113,401,156 in contracts exceeding $10,000 each in value for miscellaneous supplies to plants located in distressed employment areas. Overall dollar value of such contracts awarded to manufacturers in surplus labor areas totaled $21,798,357.

3500 Small Firms Available For Defense Production

WASHINGTON — A total of 3500 small manufacturers will have open capacity available for defense production during the third quarter of the year, according to the National Production Authority.

Figure is based on a report of small companies receiving lowest allotments of controlled materials for the second quarter. Copies of the list containing names and addresses of the 3500 firms are being distributed by NPA to the military services, Small Defense Plants Administration, and other Federal agencies engaged in procurement activities, so that idle facilities can be utilized for defense work.

Companies are located in 44 states; more than half of the total are in New York, Illinois, Pennsylvania, Ohio, and California.

These are some of the 400 machine tools which Simmons has processed as part of the Government reactivation program. Shown in the foreground are automatic screw machines; along the left, Pratt & Whitney deep-hole drillers; in the background, assorted special tools. Simmons took on this assignment while continuing its own rebuilding for industry, and new machine tools program.

Air Force Setting up Procurement Supply Depots

DAYTON, Ohio—The Procurement Div, Air Materiel Command, recently announced some effects of the decentralization program on AF suppliers.

All supply division class items will be purchased at one of the 15 depots to be set up, starting on varying dates, after July 1. At this time, exceptions will be airframes, engines, propellers, government-furnished property, items requiring extensive engineering, and initial spares and parts for them. Procurement of these items will continue at the base here.

Before procurement functions are transferred to the depots, however, contractors will be notified of the change. Information also may be obtained from the Air Procurement district and regional offices.

Depots will have prime responsibility for certain classes of items, based on proximity to source, distribution problems, or other factors. To accomplish procurement decentralization, each depot commander has been given blanket authority to purchase any item up to $10,000, regardless of type or intended use.

Physical decentralization will be made over a period of several months.

Large Jeep Order to Willys

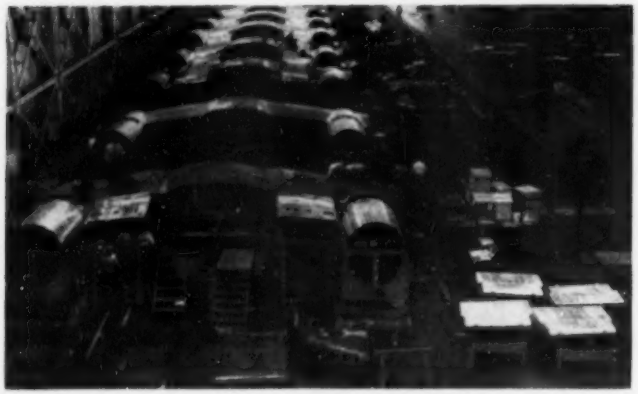
TOLEDO, Ohio — Willys-Overland Motors, Inc, has received a $27 million Ordnance order for military jeeps. The new contract increases total backlog of unfilled orders, including civilian products, to $275 million.

Jeeps on order will be the new streamlined model, with increased horsepower and greater fuel efficiency and economy, developed cooperatively by Ordnance officials and Willys engineers during the last 18 months.

ACF-Brill Motors Receives $2 Million Defense Orders

PHILADELPHIA—New defense orders amounting to $2,340,000 have been received by ACF-Brill Motors Co. A $1.5 million parts contract has been given to the company's plant here, and its existing contract for power units has been augmented by some $400,000.

The Hall-Scott Motor Div, Berkeley, Calif., has received a $300,000 amendment to its current order for helicopter transmission manufacture, in addition to contracts for overhauling V-12 engines, and modification and test of one of its regular truck engines.



Assembly jigs for center sections of the 20-ton Fairchild C-119 cargo and troop transport planes stand in a growing line at Willow Run, where Kaiser-Frazer is also manufacturing parts for a second Air Force plane—the Chase C-123, and building automobiles at the same time

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Ordnance Tank Automotive Center, Detroit

Tarnow Electric Supply Co, Detroit—replenishment of tools, $146,736.

Lipe-Rollway Corp, Syracuse, N. Y.—replenishment of motor vehicle parts, $260,906.

Electric Auto-Lite Co, Toledo, Ohio—replenishment of tank and combat vehicle parts, $141,802.

McKay Co, Pittsburgh, Pa.—replenishment of tools, $369,340.

United Auto Parts Co, Kansas City, Mo.—replenishment of motor vehicle parts, $214,500.

International Harvester Co, Washington, D. C.—replenishment of motor vehicle parts, $166,549.

Chevrolet Motor Div, General Motors Corp, Detroit—automobiles, exceeds $250,000; trucks, $195,570.

Blackstone Corp, Jamestown, N. Y.—replenishment of motor vehicle parts, $123,552.

G & O Mfg Co, New Haven, Conn.—replenishment of motor vehicle parts, $122,044.

GMC Truck & Coach Div, Pontiac, Mich.—replenishment of motor vehicle parts, exceeds $250,000.

Electric Auto-Lite Co, Toledo, Ohio—replenishment of motor vehicle parts, $179,534.

Hercules Motors Corp, Canton, Ohio—replenishment of motor vehicle parts $111,183.

Budd Co, Detroit—replenishment of motor vehicle parts, $175,020.

AC Spark Plug Div, GMC, Flint, Mich.—replenishment of motor vehicle parts, $137,945.

United Motors Service Div, Detroit, Mich.—replenishment of hardware, exceeds $250,000.

International Harvester Co, Washington, D.C.—trucks, exceeds $250,000.

Federal Motor Truck Co, Detroit—trucks, $158,844.

Kenworth Motor Truck Corp, Seattle, Wash.—trucks, $139,521.

Emerson Electric Mfg Co, St. Louis, Mo.—replenishment of small arms parts, $111,550.

Oshkosh Motor Truck, Inc, Oshkosh, Wis.—replenishment of motor vehicle parts, exceeds $250,000.

Chicago Ordnance District

Borg Products Div, Delavan, Wis.—boosters, ring assy, $1,080,000.

Cyclohm Motor Div, Racine, Wis.—charger parts for gun, $941,150.

Minneapolis-Honeywell Regulator, Minneapolis, Minn.—periscopes, $383,995.

Northwestern Corp, Morris, Ill.—burster casings, $670,211.

Malleable Iron Range Co, Beaver Dam, Wis.—shells, $484,733.

Diamond T Motor Car Co, Chicago—5-ton trucks, $24,946,239.

Frank J. Curran Co, Downers Grove, Ill.—hand grenade fuzes, $853,899.

Northwest Automatic Products Corp, Minneapolis, Minn.—metal parts, boosters, $558,080.

National Pressure Cooker Co, Eau Claire, Wis.—fuzes, exceeds $250,000.

National Day Co, Chicago—shell fins, exceeds $250,000.

Line Material Co, Milwaukeee, Wis.—shell fins, exceeds $250,000.

Sunbeam Corp, Chicago—feed mechanisms, exceeds $250,000.

Westclox Div, General Time Corp, LaSalle, Ill.—fuzes, exceeds $250,000.

International Harvester Co, Ft. Wayne, Indiana—trucks, exceeds $250,000.

Studebaker Corp, South Bend, Ind.—trucks & parts, exceeds $250,000.

Dole Valve Co, Chicago—fuzes, exceeds $250,000.

Oliver Corp, Chicago—shells, exceeds $250,000.

New York Ordnance District

Supreme Knitting Machine Co, Brooklyn, N. Y.—fuzes, exceeds $250,000.

Western Electric Co, New York—spare parts for directors, exceeds $250,000.

American Type Founders, Elizabeth, N. J.—transmission assys, exceeds $250,000.

Rheem Mfg Co, Linden, N. J.—shells, exceeds $250,000.

Conmar Products Corp, Newark, N. J.—metal parts for fuzes, exceeds $250,000.

Regina Corp, Rahway, N. J.—metal parts for fuzes, exceeds $250,000.

Cincinnati Ordnance District

Bailey Products Corp, Union City, Ind.—fuzes, $682,550.

Cincinnati Advertising Products Co, Cincinnati—fuzes, $220,180.

Schaible Co, Cincinnati—percussion primers, $434,500.

Temco, Inc, Nashville, Tenn.—illuminating shells, $5,452,894.

Allison Div, General Motors Corp, Indianapolis, Ind.—transmissions, $11,322,173; replenishment spare parts, $1,243,548.

Electric Auto-Lite Co, Toledo, Ohio—cartridge cases, $1,414,000.

Inland Equipment, Nashville, Tenn.—head assys for rockets, $435,000.

Rochester (N.Y.) Ordnance District

Precision Castings Co, Syracuse, N. Y.—fuzes, exceeds $250,000.

Pratt & Letchworth Co, Buffalo, N. Y.—castings, $139,166.

Revere Copper & Brass, Rome, N. Y.—cartridge cases, exceeds $250,000.

Eastman Kodak Co, Rochester, N. Y.—range finders with computors and spare parts, exceeds $250,000; periscopes and spare parts, exceeds $250,000; fuzes, exceeds $250,000.

Graflex, Inc, Rochester, N. Y.—telescope mounts, exceeds $250,000; fire control systems for rifles, and spare parts, $187,782.

Buffalo Arms, Inc, Buffalo, N. Y.—automatic guns, $115,152.

Springfield (Mass.) Ordnance District

Package Machinery Co, East Longmeadow, Mass.—linking, de-linking machines, exceeds $150,000; machine repositioning, $116,026.

Gilbert & Barker, West Springfield, Mass.—fire control equipment and spare parts, exceeds $250,000.

A C Gilbert Co, New Haven, Conn.—fuzes, exceeds $250,000.

Smith & Wesson, Inc, Springfield, Mass.—revolver parts, $137,750.

Chase Brass & Copper, Waterbury, Conn.—cartridge cases, exceeds $250,000.

Remington Arms Co, Inc, Bridgeport, Conn.—shotgun parts, $124,018.

Philadelphia Ordnance District

Chrysler Corp, Detroit—tanks, exceeds $250,000.

E I duPont, Wilmington, Del.—detonators, exceeds $250,000.

A B Farquhar Co, York, Pa.—mortars, exceeds $250,000.

Rheem Mfg Co, Burlington, N. J.—cartridge cases, exceeds $250,000.

ARMY SIGNAL CORPS

Philadelphia Supply Agency

Cornell-Dubilier Electric Corp, South Plainfield, N. J.—maintenance parts for power supply, $161,350.

Western Electric Co, New York—radio transmitters, $1,156,115.

Teletype Corp, Chicago—teletypewriter sets, $788,648.

Lanagan & Hoke Inc, Warrington, Pa.—code practice equipment, $1,222,468.

Stromberg-Carlson Co, Rochester, N. Y.—telegraph-telephone terminals, $1,399,459.

American Radio & Hardware Co, Mt. Vernon, N. Y.—mountings, $242,276.

Radiomarine Corp of America, New York—radio transmitters, $274,125.

Hickok Electrical Co, Cleveland, Ohio—tube testers, exceeds $250,000.

Federal Tel & Radio Corp, Clifton, N. J.—amplifiers, $133,090.

Berkeley Scientific Corp, Richmond, Cal.—frequency meters, $136,263.

Traveler Radio Corp, Chicago—mountings, $284,733.

Lionel Corp, New York—microphone headset, $499,891.

Belmont Radio Corp, Chicago—receiver transmitter $351,177.

Hallicrafters Co, Chicago—radio sets, $1,290,256.

Fada Radio & Electric Co, Belleville, N. J.—maintenance parts for power supply, $177,259.

H O Boehme, Inc, New York—amplifiers, $100,779.

Allen B DuMont Laboratories, East Paterson, N. J., receiver transmitter, $748,583.

Hickok Electrical Instrument Co, Cleveland, Ohio—spare parts for test equipment, $224,992.

American Television Mfg Corp, Chicago—electron tubes, $264,750.

Sylvania Electric Products, Boston, Mass.—electron tubes, $1,752,300.

General Electric Co, Schenectady, N. Y.—electron tubes, $1,049,729.

Machlett Labs, Inc, Springdale, Conn.—electron tubes, $862,422.

Chatham Electric Corp, Newark, N. J.—electron tubes, $529,920.

National Union Radio Corp, Orange, N. J.—electron tubes, $254,3.6.

Kollsman Instrument Corp, Elmhurst, N. Y.—humidity temp sets, $305,203.

General Communications Co, Boston, Mass. radio beacons, $237,363.

Gates Radio Co, Quincy, Ill.—radio transmitting sets, $766,966.

ARC Equipment Co, New York—aging units to tubes, $121,878.

Teletype Corp, Chicago—teletypewriters, exceeds $250,000; typing perforators, exceeds $250,000.

Aircraft Radio Corp, Boonton, N. J.—spare parts and equipment for ARC, $229,966.

Emerson Radio & Phonograph Corp, New York—packaging for radio sets, $136,428.

Western Electric Co, New York—supplement to communication system, exceeds, $250,000.

Connecticut Telephone & Electric Corp, Meriden, Conn.—signal assy for switchboards, $113,686.

Kane Mfg Corp, Kane, Pa.—cases, exceeds $250,000.

Admiral Corp, Chicago—radio sets, exceeds $250,000.

General Electric Co, Syracuse, N. Y.—spare parts, exceeds $250,000.

Parkchester Machine Corp, New York—flash ranging sets, exceeds $250,000.

Radio Corp of America, RCA Victor Div, Camden, N. J.—radio sets, exceeds $250,000.

Collins Radio Co, Cedar Rapids, Iowa—radio transmitters, $131,466.

National Cash Register Co, Dayton, Ohio—teletypewriter sets, exceeds $250,000.

Electronic Enterprises Inc, Newark, N. J. electron tubes, $206,971.

Automatic Mfg Corp, Newark, N. J.—chest sets, maintenance parts, exceeds $250,000.

Bulova Watch Co, New York—crystal units, exceeds $250,000.

Standard Piezo Co, Carlisle, Pa.—crystal units, cases, exceeds $250,000.

Westline Electronics Co, Los Angeles—crystal units, $129,341.

Henry Products, Brooklyn, N. Y.—antenna equipment exceeds $250,000.

CORPS OF ENGINEERS

Chicago Procurement Office

Ingersoll-Rand Co, Chicago—portable pneumatic drills, $135,583.

Hyster Co, Portland, Ore.—crane units, $180,791.

Caterpillar Tractor Co, Peoria, Ill.—tractors, $402,211.

Fairbanks-Morse & Co, Chicago—spare parts, $164,279.

R G LeTourneau, Inc, Peoria, Ill.—spare parts, exceeds $250,000.

American Hoist & Derrick Co, St. Paul, Minn.—spare parts, $182,385.

Waukesha Motor Co, Waukesha, Wis.—spare parts, $154,682.

International Harvester Co, Chicago—spare parts, $145,431.

Bucyrus Erie Co, Evansville, Ind.—spare parts, exceeds $250,000.

Eidel Mfg Co, Albuquerque, N. M.—spare parts, exceeds $250,000.

NAVY AWARDS

Bureau of Ships, Washington 25, D. C.

Avondale Marine Ways, Inc, Avondale, La.—steel landing craft, exceeds $250,000.

Kewaunee Engrg Co, Kewaunee, Wis.—steel landing craft, exceeds $250,000.

Berger Engrg Co, Seattle, Wash.—topping winches, $128,129.

Parker Appliance Co, Cleveland, Ohio—pressure fueling nozzles, $211,978.

National Steel & Shipbuilding Corp, San Diego, Calif.—steel deck barges, exceeds $250,000.

DeLaval Steam Turbine Co, Trenton, N. J.—pumps, exceeds $250,000.

Electro-Dynamic Works, Electric Boat Co, Bayonne, N. J.—motors, $128,829.

Woodhouse Chain Works, Trenton, N. J.—shackles, thimbles, swivels, turnbuckles, $214,147.

Gunderson Bros Engrg Corp, Portland, Ore.—steel deck cargo barges, exceeds $250,000, landing craft mechanized, exceeds $250,000.

Calmes Engrg Co, New Orleans, La.—steel deck cargo barges, exceeds $250,000.

Wiley Mfg Co, Port Deposit, Md.—steel deck cargo barges, exceeds $250,000.

Sound Ship Bldg Corp, College Point, L. I., N. Y.—steel deck cargo barges, exceeds $250,000.

Lock City Machine & Marine, Inc, Sault Ste. Marie, Mich.—landing craft mechanized, exceeds $250,000.

Laris Painting Inc, Green Cove Springs, Fla.—landing craft mechanized, exceeds $250,000.

Yarnall-Waring Co, Philadelphia—indicators, $189,285.

Capstan Machine Corp, Brooklyn, N. Y.—ammo hoist trunks $126,140.

Navy Purchasing Office, Washington 25, D. C.

Minneapolis-Moline Co, Minneapolis, Minn.—warehouse tractors, exceeds $250,000.

Lodge & Shipley Co, Cincinnati, Ohio—engine lathes, exceeds $250,000.

Buda Co, Harvey, Ill.—fork-lift trucks, exceeds $250,000.

Hughes-Keenan Corp, Delaware, Ohio—crane trucks, exceeds $250,000.

Mercury Mfg Co, Chicago—warehouse tractors, exceeds $250,000.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.—milling machine, $149,990.

Lempco Products, Inc, Bedford, Ohio—reamer blades, exceeds $250,000.

A A Gray Co, Cincinnati, Ohio—boring mill, $134,579.

New Tank Orders to Cadillac

DETROIT—An estimated $27 million increase in Cadillac's tank contract is the sixth major supplement since initiation of the program in August 1950; the new amount raises the total dollar value of vehicles built or on order to approximately $809 million.

Contract increase is to cover an additional number of T41-E1 Walker Bulldog tanks, which have been in production at the company's Cleveland plant since March 1951.

AIR FORCE AWARDS

Air Materiel Command, Dayton, Ohio

Sparton Automotive Div, Sparks-Withington Co, Jackson, Mich.—bomb rack release, $181,494.

Deutsch Co, Los Angeles—adapters, $172,796.

Collyer Insulated Wire Co, Pawtucket, R. I.—cable, $622,758.

Hevi-Duty Electric Co, Milwaukee, Wis.—regulators, $135,219.

Eclipse-Pioneer Div, Bendix Aviation Corp, Teterboro, N. J.—valve assys, $102,362.

Radio Corp of America, RCA-Victor Div, Camden, N. J.—radio sets, $2,000,000.

American Automatic Typewriter Co, Chicago—dryer-spare parts, $105,661.

Scintilla Magneto Div, Bendix Aviation Corp, Sidney, N. Y.—spare parts, $108,730.

New Departure Div, General Motors Corp, Bristol, Conn.—ball bearings, $285,311.

Adel Div, General Metals Corp, Burbank, Calif.—pumps and valves, $349,026.

Hycon Mfg Co, Pasadena, Calif.—cameras, $155,000.

Barden Corp, Danbury, Conn.—ball bearings, $168,500.

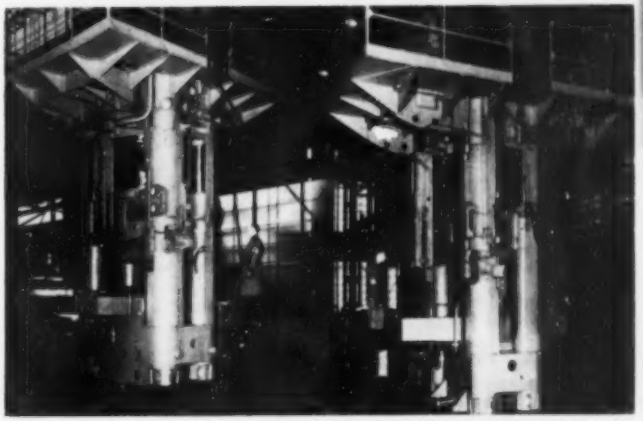
G D Richardson Mfg Co, Ft Collins, Colo.—pavlins, $197,512.

Western Mfg Co, Detroit—spare parts, $215,197.

Aro Equipment Corp, Bryan, Ohio—oxygen regulator assys, $204,844.

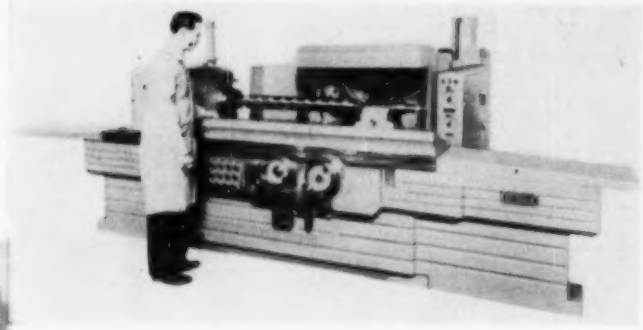
Columbia Machinery & Engrg Corp, Hamilton, Ohio—shears, $245,906.

R K LeBlond Machine Tool Co, Cincinnati, Ohio—toolroom lathes, $531,762.



These presses, now in production at Hydraulic Press Mfg Co, are two of an order for 36 for manufacturing cartridge cases. Both the 2500-ton cartridge case heading unit at left, and the 1500-ton pre-heading press at right are equipped with special controls which permit heading steel or brass cases equally well

New Shop Equipment



Automatic Compensation for Dressing on Thread Grinder

The Style-36 thread grinder is a large-capacity machine for grinding threads, worms, and other forms. It has the flexibility required for tool-room work, accuracy for thread and gage work, and automatic cycles to speed production grinding. Automatic functions include feed to finished size, wheel dressing, work-size compensation for dressing, resumption of grinding cycle after dressing, backlash compensation, control of coolant flow, lubrication, and retraction of wheel at end of grinding cycle.

It will grind single or multiple threads, left- or right-hand, in any pitch from 1 to 128 threads per in. It can be used with single- or multiple-rib grinding wheels. An attachment for grinding accurate internal threads also is available. Several types of diamond dressers may be used on the Style 36, the choice being determined primarily by the type of thread or form to be ground.

The relation of work-spindle speed to table feed can be easily changed to produce various leads. This is accomplished by means of change gears with most standard leads obtained from the gears furnished with the machine.

Right- or left-hand threads may be ground simply by positioning a lever. Setting the lever to a neutral position permits indexing the work spindle for grinding multiple-start threads and worms. An automatic indexing attachment also is available.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Pre-Stretched V-Link Belt Will Not Stretch

Detachable V-link belt is pre-stretched, will not slip, and can run in either direction.

Links are claimed to contain more plys than on other V-link belts commonly used, be uniform in camber and dimension, and made from tough woven cloth impregnated with heat- and oil-resistant crude rubber. The convex stud head is claimed to give greater strength and longer service life.

Brammer Co., 684 Broadway, N. Y. 12.

Synthetic Cutting Fluid Is Soluble in Water

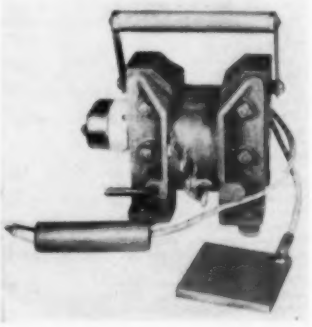
Ucon H-660, a synthetic cutting fluid that forms a solution with all proportions of water at room temperature, is claimed to be exceptionally clear—thus assuring good visibility of the work.

The fluid is reported to give excellent results when drilling, tapping, turning, sawing, milling, punching, and drawing stainless steels, carbon steel, chrome-molybdenum, and other alloy steels; aluminum; and phosphor bronze.

It can be rinsed from metal surfaces with cold water or vaporized in subsequent high-temp, heat-treating operations. However, fluid left on parts provides a rust-protective coating, and the inhibitors in the fluid are effective in water solutions.

The fluid may be used with or without water dilution. In general, a solution of one part of fluid in 2 to 2½ parts of water has worked best; but the dilution ratio may be adjusted to meet specific requirements. In grinding, one part fluid on 25 to 33 parts water is claimed to have given good results in terms of grinding-wheel-corner wear, and resistance to forming and metal burning.

Carbide and Carbon Chemicals Co, 30 E 42nd St, New York 17, N Y



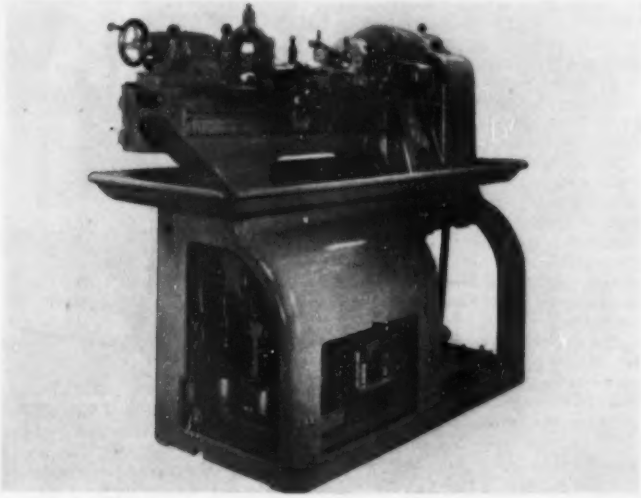
Metal Etcher and Demagnetizer Combined in One Unit

Red Head etcher is designed to provide a clean, quick method of marking steel parts; including hardened, thin, or delicate pieces. A demagnetizing unit can be added to pick up minute particles and chips adhering to parts because of magnetism. This is particularly valuable for close-fitting or sliding parts, cutters, and tools.

The etcher and demagnetizer can be purchased separately or as a unit. Three different models are available —a small model for light work, one with twice the demagnetizing power as the small unit, and a heavy-duty model.

The Mundro Products Corp, P O Box 3911, Detroit 27, Mich.

Materials and Parts



Infinitely Variable Electronic Drive on Hendey Toolmaker's Lathe

Electronic drive for the Hendey 9x24-in. tool and gagemaker's lathe fits into the base as an optional control for the 3-hp dc adjustable-speed motor.

The drive contains only two 18-amp, heavy-duty electronic rectifier tubes in the power circuit, and one smaller rectifier tube in the control circuit. It provides a stepless speed range from 25 to 3000 rpm by potentiometer control of both field and armature of the motor. Close speed control is obtained even under changing load with full torque at low speeds over the complete armature control range by means of I. R. compensation. A thermo overload relay protects the motor from sustained overloads.

The electronic unit requires approximately 60 sec for heating, and power cannot be applied before that. A pilot on the control panel lights when the tubes are energized, and the tubes will remain energized for immediate use during all ordinary standby periods.

Dynamic braking accomplishes full stop from maximum speed in approximately 1½ sec. Starting, stopping, or reversing from present speeds is done smoothly even when set at 3000 rpm.

The control panel is conveniently located for the operator. The operating handle is depressed when selecting forward or reverse, pulled to start the motor, and pushed to stop it.

The electronic drive requires 220- or 440-v, single-phase, 60-cycle current. Dc motor is 230-v, 3-hp, adjustable speed, and requires a line load of 4.2 kva. The rectifier tubes are warranted for 3000 hours.

Hendey Machine Co., Torrington, Conn.

Line of oils, waxes, and greases are claimed to have excellent high-temperature properties as well as high electrical resistance. They are chemically inert and can withstand virtually any corrosive. Known as Kel-F, the oils can be used for cable and transformer applications where heat resistance and good dielectric properties are essential. Main ingredient of the products is a fluorocarbon plastic.

Chemical Mfg. Div., M. W. Kellogg Co., P. O. Box 469, Jersey City 3, N. J.

...INCLUDING

Automatic sheet lifter eliminates hand feeding the drawing-compound coater.....page 152

Punch-press slide feed converts hand-fed presses to automatic operation .....page 152

Heavy-duty drilling machine can drill up to 600 holes at a time automatically .....page 154

Cabinet lathe has choice of countershaft or variable-speed drive, and dual A-belts driving the spindle pulley .....page 159

Coater with six accessory materials-handling kits can handle wide range of material..page 166

Three-spindle turret head permits individual speeds for spindles—allowing sequence work without removing work from jig..page 172

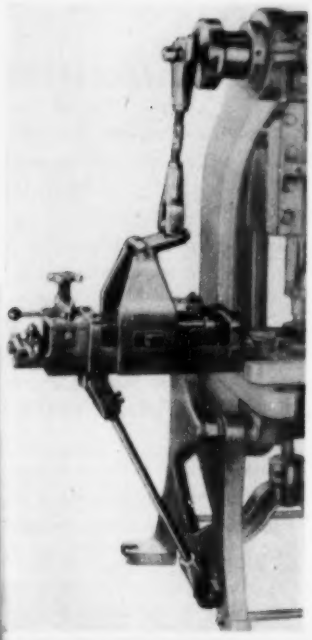
NEW BULLETINS for your Shop Library, including a 64-page manual on tool-and-die-salvage welding.....pages 155 and 156

... and in August 4

Optical micrometer for optical tooling quickly and accurately aligns fixtures on a jig frame

High-speed machine chamfers the entire tooth contour at both heel and toe ends of zerol bevel-gear teeth

Greater Accuracy, Ease of Setting On Punch-Press Slide Feed



Slide feed operates off the press crankshaft, converting hand-fed presses to automatic operation.

Lighter and stronger heat-treated castings make the feed easy for one man to handle. It is reported to maintain accuracy of feed on long or short runs without overthrows. Ease of setting and adjustment makes it particularly adaptable where a variety of feeds is necessary.

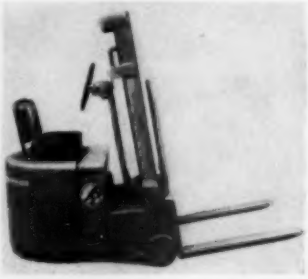
Double feed stops outside the guide rods prevent any interference with the stock. The check roller system of positive stock control incorporates an improved, fully-enclosed clutch. A check roller release makes possible fast stock handling without changing the preset roller pressure.

The gripper blade, point of greatest wear, has a carbide tip. The blade is adjustable vertically for hairline setting and locks positively, allowing the gripper to be engaged or disengaged without having to readjust the blade in any way.

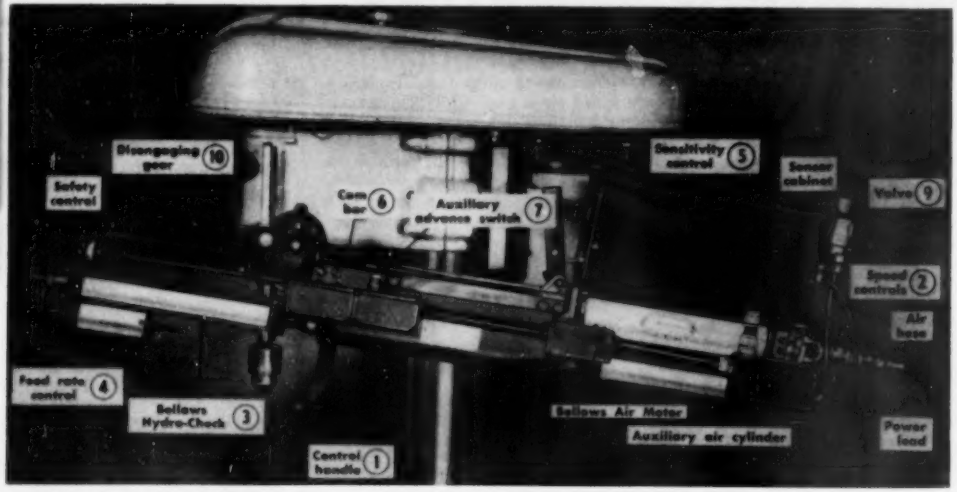
A stock support roller is quickly removable when not needed. The feed takes stock up to 4 in. in width and 5/32 in. thick with a maximum lead of 6 in.

The feed is supplied with adjustable upper connecting rod, lower supporting rod and fittings, and adjustment hub of correct dia to fit crankshaft as ordered. Left-to-right feeding is standard; special connections can be supplied when required.

Cooper Weymouth, Inc., 277 Noble Ave., Bridgeport 8, Conn.



LIGHT-DUTY ELECTRIC FORK TRUCK is said to be manufactured with heavy-duty components and have stamina for long periods of efficient, full-power service but with slightly less travel and lifting speed. Known as the J model, it is claimed to be lower in price than any available and demand less space. ***— Lewis-Shepard Products Inc, Dept R-1, Watertown, Mass.***



SENSITORQUE DRILL PRESS FEED does not depend upon any pre-determined timing cycles for its operation. By measuring the torque on the drill, it "senses" what is going on in the bottom of the hole and sees that the drill is withdrawn only when the strain approaches the danger point. By eliminating needless withdrawals, it reduces production costs. The unit consists of a Sensor Cabinet mounted on a standard Bellows Model DFE 2-540 drill-press feed. If the drill becomes clogged with chips, runs dry of coolant, hits a blow hole or seizes in any way, an electrical impulse is instantaneously sent by relays to the feed which withdraws the drill and then immediately returns to working position. Amount of withdrawal is adjustable, and a Bellows Hydro-check eases the drill back into the work after a withdrawal. By means of a rheostat, unit can be set to react to a drill torque of a few inch-ounces up to the full spindle motor power. — *The Bellows Co., 230 W. Market St., Akron 9, Ohio.*

Air-Borne "Friction Fighter"

Alemite OIL-MIST Lubrication

✻ extends bearing life as much as 17½ times!

cuts oil consumption up to 90%

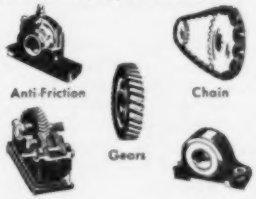
boosted production 50% at one plant!

Here from Alemite—world leader in lubrication—is lubrication progress so major—so far reaching—as to command the interest of *every* executive concerned with industrial lubrication practices and costs. Alemite Oil-Mist! The most efficient, continuous, fully automatic system in the field of machinery lubrication.

Alemite Oil-Mist! The system that atomizes oil into *mist*—distributes it through tubing to bearings—bathes *all* bearing surfaces with fresh, clean, cool oil film. A system that simplifies and materially cuts the cost of machinery lubrication. And the lubricator unit has no moving parts.

Oil-Mist uniformly maintains oil film on plain and anti-friction bearings, gears and chains *regardless of variations in load, temperature or speed.* Eliminates the "human element."

ALEMITE OIL-MIST
Lubricates All Types of Mechanisms



✻ **Reports Like These Prove Oil-Mist Results!**

Before Oil-Mist: 32 Leather Stitchers at an eastern shoe manufacturing company were turning out 80 dozen pair of field boots per day. Pinion gears and other working parts demanded constant oiling . . . constant attention.

After Oil-Mist: The same 32 machines and operators are now turning out 120 dozen pair a day—a production increase of 50%! And vital machine parts are well oiled always – automatically – with Oil-Mist.

Check All These OIL-MIST Advantages!

- Reduces bearing temperatures as much as 20%.
- Continuous, uniform lubrication of all bearings.
- Air pressure seals bearings against dirt.
- Reduces oil consumption—up to 90%.
- Prevents product spoilage.
- Eliminates guesswork — each bearing picks up as much Oil-Mist as it needs.
- Reduces starting and running torque.

Get the Facts NOW!

Alemite, Div. of Stewart-Warner, Dept. C-72
1850 Diversey Parkway, Chicago 14, Illinois

☐ Please send me a FREE copy of your new and complete Oil-Mist Catalog.

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

My Name _____

Title _____

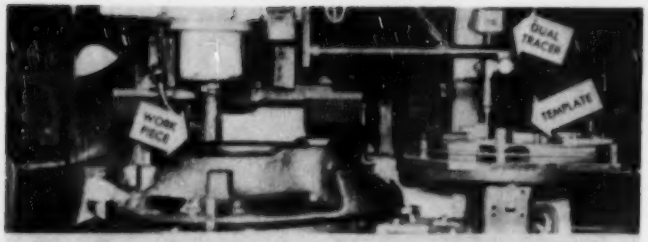
Company _____

Street _____

City _____ State _____

Alemite OIL-MIST Lubrication

A Product of SW STEWART-WARNER



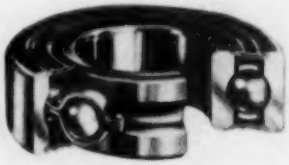
Lodge & Shipley Duplicator Can Reproduce Compound Curves

For use with either milling machines or lathes, this duplicator accurately controls two feeds and can reproduce, from templets, internal and external compound curves and 90° shoulders.

It acts as an attachment and does not have to be removed for use of the machine on other work. It can be moved from machine to machine and normal feeds and speeds can be employed for milling, turning, boring, and shaping.

Distributed by:

Tracer Control Co., 595 East Ten Mile Road, Hazel Park, Mich.



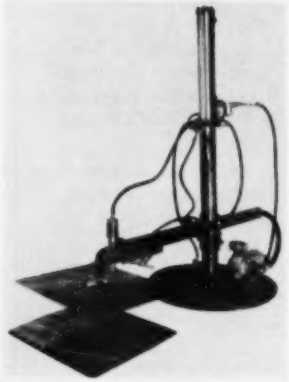
SKF Sealed Ball Bearing Interchangeable with Non-Sealed

Known as Red Seal bearings, the seal is made of Du Pont Fairprene, and is not affected by petroleum-base lubricants, normal operating temperatures, or aging. The seal extends below the steel retaining ring, forming a flexible lip which lightly touches a smooth, uniform chamfer of the inner ring.

Retaining rings have circular-formed ribs giving them good rigidity and are staked securely.

The bearings are delivered factory lubricated. They are supplied in standard single-row SAE widths, and are available in any combination of snap rings and metal shields.

SKF Industries Inc, Philadelphia 32, Pa.



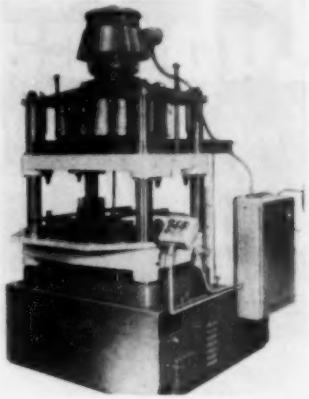
Automatic Sheet Lifter Contains Own Vacuum Plant

This unit eliminates the costly hand method of lifting and feeding sheets into a compound coater. It automatically picks up the top sheet from a bundle and places it on the coater conveyor. The only personnel required to operate both units is stationed at the off-bearing end of the compound coater where it can take the individual sheets and place them by hand into the drawing press.

The lifter is completely adjustable to pick up from 1 to 6 sheets per minute, and can handle sheets up to 48 x 48 in. Sheets can be up to 200 lb in weight.

The vacuum cups, by special design and placement, break the vacuum between the two top sheets and the bundle, and lifts the top one only. It has a 4-in.-dia air cylinder with a 36-in. stroke, and consumes approximately 0.6 cu ft of compressed air per cycle. It comes complete, ready to hook up to your air line and electric power supply. Price—$1995.

Union Tool Corp., 314 E. Market St., Warsaw, Indiana.



Six-Hundred Holes at a Time On Standard Zagar Driller

Zagar has standardized four sizes of heavy-duty drilling machines to produce as many as 600 holes at one time. They are 16, 24, 32, and 40 in. and are designed to take interchangeable Zagar drillheads.

Changing from one job to another is comparable to punch-press setups and can be accomplished in a few hours—no electrical or plumbing connections are necessary.

Drillheads are driven directly by electric motors ranging from 5 to 30 hp. A hydraulic ram in the base feeds the work into the drills and automatically lowers to original position after drilling is completed. Cycling, completely automatic or semi-automatics is actuated hydraulically with electrical controls. The machines are self-contained with oil and coolant reservoirs, pumps, hydraulic controls, and electric motors located in a steel base.

Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GRINDERS—*Reid Brothers Co., Inc., Beverly, Mass.* 4-page folder describes four models of No. 618 precision grinders. Includes features, specifications, and list of attachments and accessories.

2 ASSEMBLY PRESS—*Precision Dorsett Co., Detroit 11, Mich.* 12-page bulletin illustrates and describes press, automatic index table, and press heads. Dimensions are included.

3 FORGING PRESSES—*E. W. Bliss Co., Canton, Ohio.* 4-page illustrated catalog G gives specifications for presses ranging in capacity from 20C to 4000 tons.

4 MULTIPRESSES—*Denison Engineering Co., Columbus 16, Ohio.* 8-page illustrated booklet describes variety of applications of presses, particularly when used in conjunction with index tables.

5 UNIVERSAL GRINDERS—*Landis Tool Co., Waynesboro, Pa.* 16-page catalog describes 14-in. and 16-in. Type-C precision grinders. Detailed specifications and pictures of typical chip setups are included.

6 TABLETTING PRESSES—*E. J. Stokes Machine Co., Philadelphia, Pa.* Catalog-949 pictures and describes complete line of presses, single-punch, rotary, mechanical, and hydraulic. A section is included on punches and dies, die materials, and shapes.

7 DRILLING AND TAPPING MACHINES—*Hartford Special Machinery Co., Hartford, Conn.* 6-page booklet illustrates, describes, and gives specifications of line of machines, including components.

8 MACHINE TOOLS—*S&S Machinery Co., Brooklyn, N. Y.* Catalog 551 gives partial listing of new machines available, including presses, grinders, lathes, millers, drills, etc.

9 SQUARING SHEARS—*Wysong & Miles Co., Greensboro, N. C.* 16-page booklet pictures and describes complete line, including specifications and data on components.

TOOLS AND ACCESSORIES

10 CUTTING TOOLS—*Gairing Tool Co., Detroit 11, Mich.* 12-page illustrated catalog describes lines of standard tools, including interchangeable counterbores, back spotfacers, core drills, and milling cutters. Specifications are included.

11 ROUTER BITS—*Ekstrom, Carlson & Co., Rockford, Ill.* 4-page bulletin gives descriptions, pictures, and prices of spiral-flute router bits, with straight or taper shanks, single or double flute and end, with either up- or down-cut.

12 MULTI-CYCLE ELECTRIC TOOLS—*Ingersoll-Rand, New York 4, N. Y.* 36-page catalog covers complete line, including impactools, nut runners, drills, screw drivers, grinders, hollers, sanders, and polishers. Lists of equipment and accessories are given.

13 GAGES—*Federal Products Corp., Providence, R. I.* 28-page bulletin illustrates various types of automatic gaging methods, including electronic continuous measuring gages.

14 VISES—*Diamond-Stephens Mfg. Co., Urbana, Ohio.* 24-page catalog features illustrations and applications of complete line of industrial and utility vises. Listing of repair parts, with drawings, is included.

15 DIAMOND WHEELS—*Diamond Tool Research Co., New York 17, N. Y.* 24-page catalog gives information on 10 types of diamond wheels in diameters from ½ to 8 in. in a complete range of grits, diamond depths, and concentrations.

16 DIAMOND WHEELS AND HONES—*J. E. Smit & Sons, Inc., Norway Hill, N. J.* 28-page catalog and price-list 52 gives complete information and specifications of Seconset Hone, including natural, metal, and vitrified bond.

17 BIT HOLDERS AND INSERT BITS—*Apex Machine & Tool Co., Dayton, Ohio.* Catalog 52 gives complete listing of holders and inserts to drive a variety of screws. Hand drivers and sockets are also catalogued in the mentioned booklet.

Name .....
Title .....
Company .....
Co. Address .....
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AMERICAN MACHINIST, New York

FILL IN BELOW NUMBER OF ONE CATALOG WANTED

Not good after Sept. 21, 1952

HEAT-TREATING AND WELDING

18 HEATING UNIT — *Lewis Machine Co., St. Paul, Minn.* Brochure details uses and operation of Lewis-Lind electronic high-frequency unit. Illustrates soldering, brazing, annealing, and other controlled heat applications, plus automatic timer-control features.

19 FUSION WELDING — *Fluo Supply, Eclair Aircraft Co., San Diego 12, Calif.* Illustrates sources of difficulties in metallic arc, heat arc, and other fusion welding of alloy steels, and describes uses and applications of Eclair Fluo to reduce welding time.

20 TOOL & DIE SALVAGE WELDING — *Eutectic Welding Alloys Corp., Flushing, N. Y.* 64-page illustrated manual on latest developments and techniques; charts and diagrams complement discussion of procedures.

21 RESISTANCE WELDING EQUIPMENT — *Main-Hadwen Welding & Mfg. Co., East Detroit, Mich.* 68-page catalog describes line of rocker-arm spot welders, projection, portable, hydromatic, multiple transformer welders, and hydraulically-operated resistance upsetting.

PLANT-SERVICE EQUIPMENT

22 *FANS — DeBothezat Fan Div. American Machine & Metals, Inc., East Moline, Ill.* Illustrated catalog on fiberglass fans, designed for exhausting fumes or gases which are abnormally hot, flammable, or explosive. Contains specifications, dimensions, and capacities.

23 AIR-LINE FILTER — *Sales Corp. of America, Philadelphia 44, Pa.* Bulletin SC-1007-1052 describes equipment for removal of water, water-oil emulsions, and dirt from compressed-air and gas lines. One series of Sales Liqui-Jectors covers ranges of 10-to-70 cfm; a second, from 100-to-500 cfm.

24 MATERIALS DISPENSING EQUIPMENT — *Lincoln Engineering Co., St. Louis, Mo.* 11-page catalog 49 describes line of power-operated pumps, spray-pails and Flo-guns, hose and accessories for applying materials and compounds. Illustrated applications and specifications are included.

25 RUBBER LINK MATTING — *Keller Sales Corp., Chicago 12, Ill.* 4-page circular describes types of industrial floor matting to ease leg strain.

26 MELTING FURNACES — *Lindberg Engineering Co., Chicago 39, Ill.* Bulletin 540 illustrates operation of stationary and tilting-type, two-chamber units. Rating capacity-dimension table and typical applications are included.

27 DUST CONTROL — *American Wheelabrator & Equipment Corp., Mishawaka, Ind.* 4-page periodical, "Dust & Fume Topics" discusses handling and control problems, and recent developments in design of cloth-filter collectors.

28 ALUMINUM PAINT — *Speer, Inc., Cleveland, Ohio.* Bulletin 110251 describes Heat-Ban H-110, a specially-formulated aluminum paint which withstands temps up to 1200F, and air-dries on cold surfaces in 10 minutes. Applications and coverage data are included.

29 ELECTRIC TRACTOR — *Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia, Pa.* 6-page booklet describes MT Worksaver for industrial towing applications. Features and specifications are included.

30 PLASTIC TAPE — *Labelon Tape Co., Rochester 4, N. Y.* Folder-8 gives data on a pressure-sensitive plastic tape which can be written on for use in a labeling kit. Product is resistant to dirt, oil, water, solids, and temps from -40 to 160F. Descriptive data included.

PARTS AND MATERIALS

31 GAGING — *Sheffield Corp., Dayton, Ohio.* 36-page booklet, "Dimensional Control & Gaging Policy," covers tolerances, reference temp, fixed gages, multiple automatic devices, etc. Illustrations, charts and descriptions of precision measuring instruments are included.

32 ELECTRICAL CONTACTS — *Gibney Electric Co., Pittsburgh 21, Pa.* 12-page illustrated catalog C-525 describes properties, uses, and applications. Data is included on powdered-metal compositions.

33 BALL BEARINGS — *Miniature Precision Bearings, Inc., Keene, N. H.* Catalog 52D contains specifications on 124 different types and sizes, plus engineering data sheets covering load ratings, dimensions, tolerances, bearing installations, etc.

34 ALUMINUM-MILL PRODUCTS — *Republic Metals Co., Lombardy, Ky.* 16-page, 4-color brochure gives data on wrought aluminum alloys. Contains an alloy selection guide, and material on fabricating and finishing.

35 RELIEF VALVES — *A. W. Cash Valve Mfg. Corp., Decatur 60, Ill.* Bulletin 200 describes a new safety valve. Cash Asco's Type P-51, said to have highest hot discharge rate of any product of comparable size.

36 LOW-CARBON NICKEL STEEL — *International Nickel Co., New York 6, N. Y.* 12-page booklet describes a ferritic steel resistant to embrittling effects of low temp (-320F). Tables and charts give mechanical properties and effects of heat treating and welding.

37 CARBIDE-GRADE CHART — *Adamas Carbide Corp., Harrison, N. J.* Chart CG lists carbide manufacturers' grade recommendations of products best suited for specific applications. Proper grades are indicated for chip removal on steel and nonferrous materials from roughing cuts through precision boring.

38 BEARINGS — *Thomson Industries, Inc., Manhasset, N. Y.* 4-page bulletin describes operating principles, design advantages, and application of nylon-lined bearings for rotation and reciprocation.

39 TRIPLE-ALLOY STEEL — *Carpenter Steel Co., Reading, Pa.* 8-page brochure gives analysis, available forms, description, applications, and instructions for working No. 4-676 triple-alloy steel.

MISCELLANEOUS

40 STAMPING EQUIPMENT — *Detroit Stamping Co., Detroit 2, Mich.* 6-page brochure describes range of production equipment for high volume, intricate precision stampings, including advantages, limitations, and specialties.

41 DRILLING CALCULATOR — *Pratt & Whitney Machine Tool Co., Cincinnati, Ohio.* Slide rule for drilling eliminates calculations for: drill rpm, proper feed for rpm, drilling times, and hp required.

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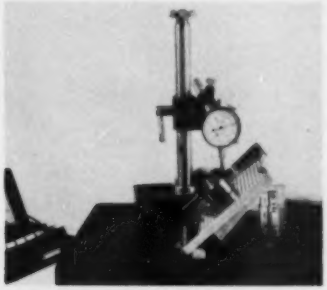
DoALL PRODUCTION NEWS

Vol. 1 Published by The DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois No. 6

New DoALL 5" and 10" Sine Plates for Checking Angles

In addition to a standard 5" sine bar, DoALL now offers 5" long and 10" long laboratory grade sine plates to facilitate precision layout and checking of angles of gages and parts. The plates, manufactured by the DoALL Gage Division, are of oil hardening tool steel, hardened, drawn and stabilized to prevent warpage, growth and shrinkage. Surfaces are serrated and lapped. All

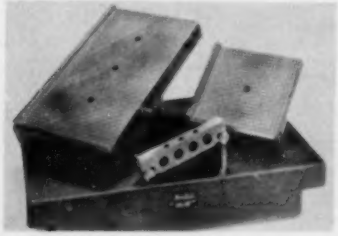


DoALL 5" sine plate, gage blocks and dial indicator being used to check face angle of a bevel gear.

tolerances are within those specified by the National Bureau of Standards and the proposed Military Specifications MIL-S-4458 (USAF) for Sine Bars and Plates, Laboratory Grade.

The sine plates are provided with tapped holes on working surfaces and edges for clamping purposes. Over-all working surface of the 5" plate is 6" x 6"; of the 10" plate 7" x 12". Side rails are provided for two edges of each plate. The base cylinder of each plate is in two sections to minimize errors common to long cylinders.

Literature and prices for the DoALL sine bar and sine plates are available upon request.



DoALL 5" sine bar and 5" and 10" sine plates displayed on DoALL surface plate.

DoALL Offers Calibration Service for All Makes of Gage Blocks

Periodic Inspection Uncovers Any Inaccuracies Due to Wear or Damage; Prevents Costly Errors

Size Check Only $16.50 for 83-piece Set

The DoALL Gage Laboratory offers two types of inspection service for any make, size or type of gage block:

DoALL Certificate of Inspection for gage blocks lists size and error of each block.

A. **Size Check** (blocks returned 48 hours after receipt):

1. Removal of nicks and burrs wherever possible.
2. Measurement of each block by comparison with Masters certified by the National Bureau of Standards.
3. Notation of amount of error for each block.
4. Identification of those blocks found to be in error more than .000003" beyond their normal tolerance. Replacement is recommended in accordance with practice of the Bureau of Standards.

A size check costs only $16.50 for an 83-piece set and proportionately less for smaller sets.

B. **Complete Laboratory Inspection** (blocks returned within one week after receipt):

1. Four-point inspection and service identical to that listed above under "size check."
2. **Flatness** check and indication of amount of error.
3. Check for **parallelism** and indication of amount of error.

The two inspection services listed above are offered at nominal cost. They make it possible for block users to know exactly the accuracy with which they are working and to know which individual blocks need replacing in order to maintain dimensional quality control and eliminate costly errors and rejects.

These inspection services are available at any time without advance notice and, additionally, arrangements can be made for regularly scheduled inspections, the frequency depending upon the amount of use the blocks receive.

Full details and prices available upon request.

———See Next Page——▸

New Claw Tooth Band For Faster Cutting of Metal, Wood and Plastics

Hard Edge Flexible Back Band Has Teeth of Positive Rake Angle

After thorough field testing, DoALL Claw Tooth Saw Bands are now available to industry. Large scale production of this unique saw band was made possible as the result of a new toothing technique perfected by DoALL. The new technique was developed to permit the mass production of a hard edge, flexible back band having teeth with a positive rake angle, an unusual combination of characteristics.

Positive Rake Facilitates Cutting

The positive rake angle of the teeth gives the teeth a hooked, claw-like characteristic. This facilitates tooth penetration into the material being sawed for greater sawing efficiency. The hooked tooth actually "pulls" into the material affording free cutting and less feed pressure is required. Very fast cutting performance can therefore be expected in cutting of metals, fibrous material (wood and wood products) and plastics.

Another characteristic of the Claw Tooth band in addition to the positive rake angle of the teeth is the extreme hardness of its cutting teeth. Consequently, the teeth retain their cutting edge and set longer. In fact, the band has such an unusually long cutting life at high production rates that it is cheaper to replace bands than to resharpen and reset. A considerable reduction in the over-all year expenditure for band sawing operations can be expected with Claw Tooth since sustained high production is obtained while the need for resharpening and resetting equipment is eliminated.

Wideness Unusual in Hard Edge Band

The Claw Tooth band is available in widths from ¼" up to and including 1¼", and in pitches, depending upon width, of 2, 3, 4 and 6. Two new widths in this range of 1¼" and 1½" are unusual in a hard edge, flexible back band and make the band applicable to a much wider range of cutting operations, particularly in the woodworking field where wider bands requiring frequent resharpening have been used.

Incorporation of the positive rake angle teeth into a hard edge flexible band is a further achievement by DoALL in offering the most complete line of band tools for all types of band machining operations. The new band is available from all DoALL stores.

Wheel Life Up 400%, Production Tripled with "Cool-Grinding"*

Milwaukee Precision Grinding Corp. Licks Difficult Form Grinding Job

The opportunities for increasing efficiency with DoALL "Cool-Grinding", in which coolant flows *through* the wheel and out in a fine mist at point of contact of wheel and work, are very well explained by the experience of Milwaukee Precision Grinding Corp. The story is covered in the following letter from Mr. Alfred Axt, president:

". . . the parts are cavity insert supports for multiple molding dies used in the production of television tube sockets. It was decided to grind the slots in these parts from the solid heat treated blank after cylindrical grinding. Now, any grinder hand requested to do such a job on an old fashioned, hand-cranked machine would, in our opinion, have ample reason to quit. Even on a fully automatic DoALL Grinder, it represents quite a chore . . . five-eighths of the weight of these blanks is removed by grinding.

Dry Grinding Fails

"We first tackled the job with dry grinding. The slots were roughed out with a straight wheel slightly under the specified width, staying a safe distance away from the point of tangency. It was terrible; even with an 80-H wheel we would experience burning after grinding only a few slots and the wheel would wear tapered. To add to our misery, we were losing size which would leave too much stock for our finishing wheel. The worst was yet to come, as we had a precise bit of form grinding to do on this job with tolerance of .0001". Another problem was that the heat generated by grinding would warp the slender .196" mandrel supporting the work.

"Cool-Grinding" Succeeds

"After struggling along with this job for about two weeks, we took delivery on a new DoALL G-1 Grinder equipped with 'Cool-Grinding.' This machine was still on the platform, not yet in use. In a moment of desperation we 'robbed' this grinder of its 'Cool Grinding' equipment and transferred it to the older DoALL to see if it would help. The result was amazing; it completely eliminated our heating and burning problem. We now had only one trouble —wheel wear. So, we gradually decreased the grain size and hardness of our wheel running through 100-I; 120-I; 150-J and finally ended with a 180-K which as you know is extremely hard and fine. From this point on we really got some work done, accomplishing more in a day than we formerly did in three or four days.

"It is plain to see that when a form consisting of a 180 degree radius is lost there is no 'touching up' possible. It is necessary to remove a full quarter inch from the wheel and start all over. That is why it was so important to get as much work as possible from one dressing. 'Cool-Grinding' made it possible to step from an 80-H to a 180-K with the resulting increase of three to four hundred per cent in wheel life."

"Cool-Grinding" attachments are available for new and old DoALL Grinders. A free demonstration on your work at your plant is available upon request.

U. S. Patent No. 2470350

NEW DoALL TOOL-SAVER LENGTHENS TOOL LIFE

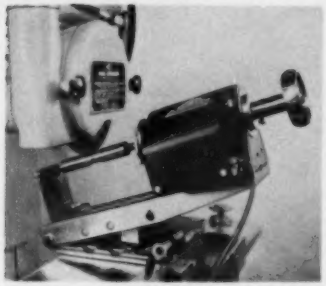
Wax-type Lubricant Stick Improves Hundreds of Metal Cutting Jobs

DoALL Tool-Saver, a new stick form lubricant composed of the finest wax ingredients, offers faster, smoother metal cutting and longer tool life. It is applicable to band sawing, grinding, sanding, tapping, drilling, spinning, pipe cutting and many other operations.

Tool-Saver is applied directly to the tool.

Users report much longer tool life, elimination of burrs on work piece and smoother finishes with no burning. Economical, long-lasting Tool-Saver is available from local stocks.

Cylindrical Grinding Attachment Pays Off



". . . completely reliable, maintains concentricity within .0001" . . . has repaid original cost many times over." —O.K. Machine and Tool Corporation, New York City.

". . . use it in making Registration Pins for motion picture cameras . . . no difficulty in holding .0001" tolerances . . . would not want to part with it."—Columbia Pictures Corporation, Hollywood, California.

The DoALL Cylindrical Grinding Attachment for DoALL Precision Surface Grinders will handle cylindrical parts up to 7⅛" long x 6⅛" diameter, either on centers or collets or chucks. Twenty-four index divisions and accurate two-way sine bar make possible exact duplications of angles and tapers. Spindle speeds are 200, 400 and 700 rpm. Literature is available upon request.

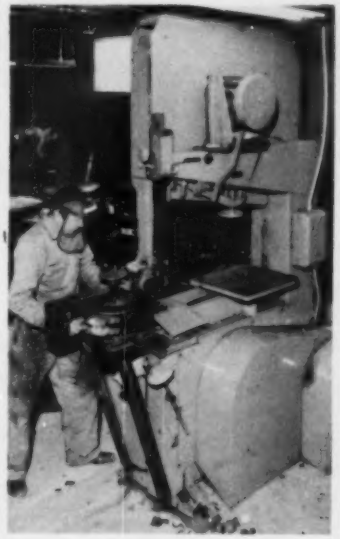
Light-Tight Porthole Vents Produced Five Times Faster with 10,000 F.P.M. Band Sawing

Contractor Also Reduces Rejects of Navy Deadlights by 90% with DoALL Zephyr Machine

In wartime, lights showing aboard a ship can cause its destruction by enemy action. To provide ventilation through portholes without permitting light to be seen from the outside of the ship, the Navy uses deadlights which are similar in general appearance to ordinary louvers, but having three 90 degree breaks in the baffles as illustrated.

The baffles are separated by spacers and held in position by four rods. After the assemblies are welded they must be cut into true circles, accurate to 1/32 inch to fit into a preformed ring.

Utility Sales and Engineering Co., Rochester, Minn., contractor on this work, originally utilized an ordinary metal cutting band saw and a special clamping fixture to cut these circles. Cutting time ran forty to sixty minutes per assembly with rejects running as high as one out of every two pieces.



Friction Sawing

In answer to a request for assistance, DoALL engineers recommended friction band sawing (high speed cutting wherein the heat generated by friction literally softens the metal ahead of the saw teeth). A DoALL Zephyr machine was put on the job with a ⅛" 14-pitch DoALL friction band driven at 10,000 feet per minute. The band machine table was removed and the saw guides brought close together to insure close tolerance work. The original clamping fixture for holding the baffles was also employed.

The baffles are now cut accurately in eight to ten minutes, five times the previous output, with a reject rate not exceeding 5%, or one-tenth the original condition.

DoALL high speed band sawing, using a DoALL friction saw band, specially designed and heat treated to "lock" the teeth in position, is being increasingly employed for fast cutting of ferrous metals including stainless steels. Complete information is available upon request.

DoALL Mobile Demonstration Units Will Show Equipment at Any Plant

Yearly, hundreds of demonstrations of DoALL Band Machines, Surface Grinders and other equipment are made at plants throughout North America by DoALL Mobile Demonstration Units.

Through such demonstrations, plant men are given an opportunity to evaluate DoALL equipment in their own plants on their own work. This method of evaluating and selecting equipment has won wide favor from those who have witnessed demonstrations. "It sure saves time and money when you bring the machines to us, instead of our going to see them or buying from a catalog", is a common comment.

DoALL demonstrations are given free of charge upon request and without obligation.

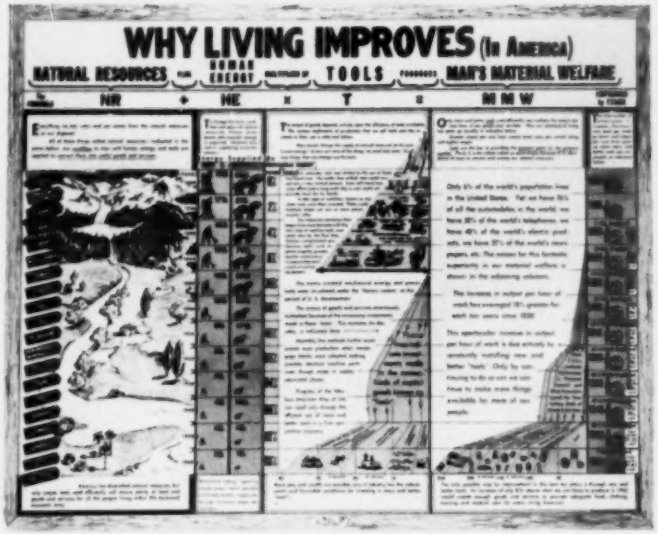
———See Next Page———→

Chart Graphically Portrays How Tools Have Multiplied Man's Productivity

Shows Present Living Standard is Direct Result of Mechanization

The fascinating story of man's material progress in America is visually portrayed in a six-color chart issued by The Wilkie Foundation and available free of charge from The DoALL Company. This 22" x 17" chart, free of advertising matter and suitable for framing, shows the continuous increase in an individual's productivity from the year 1600 through to an estimate for the year 1960. In the year 1800 a man worked 70 hours per week and produced only 27 cents worth of goods per hour. Of the energy applied to our natural resources to convert them to useful purposes, 16% was supplied by men, 80% by animals and only 4% by mechanical energy and power tools. In 1950 the average work week was 40 hours, and $1.21 worth of goods were produced for every manhour because 92% of the energy expended was *mechanical*, and only 4% human and 4% animal. The result: more material goods for everyone.

For a copy of the Chart, send twenty-five cents to The DoALL Company, Des Plaines, Illinois.



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No. 6—66M—6-52

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The quiet, vibration-free performance of Farrel herringbone gears is the result of extreme accuracy of tooth spacing, contour and helix angle, and other qualities inherent in the Farrel-Sykes method of gear generation. Why these gears continue to operate so quietly, after many years of service is shown by the diagram illustrating the nature of the contact between a pair of Farrel gears.

The lines of contact are oblique across the face of the teeth, and the pressure is evenly distributed over each tooth, from tip to working depth line. This means that there is no tendency for the contour of the teeth to wear unevenly.

Farrel herringbone gears are made of the finest grade materials, in a complete range of sizes from 1/4 inch to 20 feet in diameter. Write for further information or for engineering assistance.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

Farrel-Birmingham

FB-743

Atlas Clausing Lathes

Atlas Press recently purchased the Clausing Mfg Co, producers of heavy-duty 12-in. precision lathes. Several refinements of design and construction have been incorporated in the two series of lathes now being manufactured.

The 6300-Series lathe, illustrated above, features a forged, ground steel spindle, with 1-in. collet capacity, ASA—L—00 tapered key-drive nose. Spindle and leadscrew are Timken tapered roller-bearing equipped. Other features are: outboard drive, with dual A-belts driving the spindle pulley; choice of countershaft or variable-speed drive; wide, thick bed with two V-ways and two flat ways precision ground; headstock, quick-change gearbox, and apron enclosed—all have splash lubrication.

The 4800-Series lathe has a Timken tapered roller-bearing equipped spindle. Spindle is threaded, has ½-in. collet capacity. Apron is double walled, gears and shafts are splash lubricated. Built-in countershaft has friction clutch and brake. Quick-change gear shafts turn on ball bearings. All ways are precision ground.

Specifications for both lathes: 24, 36, and 48 in. between centers; 12¾-in. swing over bed, 7½ in. over saddle; thread range 48—4 to 224 Standard, right or left.

Clausing Div, Atlas Press Co, 2304 N Pitcher St, Kalamazoo, Mich

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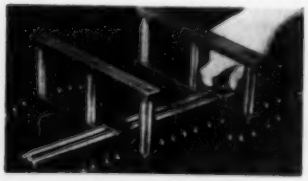


Portable Parallel Unit Supports Dies While Machining

The Acro die cradle eliminates haphazard methods of supporting dies, jigs, etc. during drilling, counterboring, tapping, milling, or grinding.

The device consists of (a) two parallel units, each 4 in. in height and 8⅞ in. in length, in the form of a frame, with center and end posts 1 in. in dia supporting top and bottom bars of 1 in. width and ½ in. thickness; (b) an adjusting rail 20 in. in length, 1¼ in. wide, and 7/16 in. thick (with full center slot) which joins the two parallel units together. Two bolt-and-wing-nut units permit quick sliding adjustment to any desired spread up to 18 in. Further adjustment is possible by pivoting these parallel units so that either the front or rear ends point inward or outward, at practically any angle.

The die cradle is set up on the workbench, drill press, or wherever needed and the parallels adjusted to the desired spread for accommodating the work.

Acro Safety Parallel Div, 2½ S Crawford Ave, Chicago 24, Ill.

Electronic Welder Control Provides Easier Installation

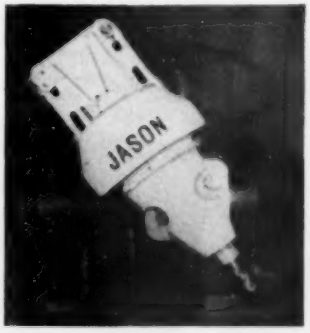
Square D has simplified the design of its electronic synchronous resistance welder control. The result is easier installation, less maintenance, smaller size, and greater mounting versatility.

The NEMA 3B weld and sequence timing circuit has been simplified so that only four tubes plus a valve relay and firing relay are required. Firing of pilot tubes are synchronized to minimize transients and ease stress on the welding transformer.

Interchangeable NEMA 3B and 5B timer panels are quickly detached from the doors. Plug connectors to the pilot pack in the cabinet permits easy replacement. The controller requires little more space than formerly needed for the ignatron contactor alone.

The enclosure design permits wall or side-of-machine mounting with the same controller without the additional trouble of relocating the adjustor dial assemblies. Installation is easier because of more wiring space below the contactor and a vertical wiring channel extending the full height of the cabinet.

Square D Co, Milwaukee 12, Wis.



Multi-Purpose Milling Attachment

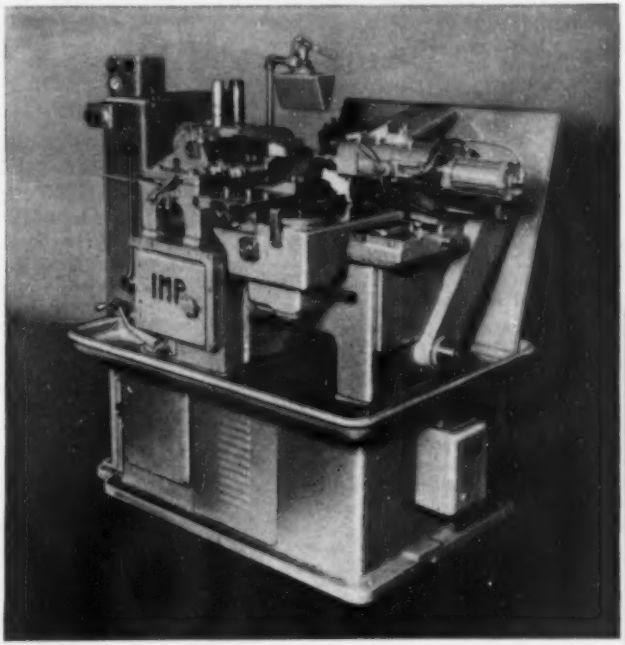
This Jason milling attachment will operate at any angle and will take up to ¾-in. end mill. Known as the Model 51, it is said to be both accurate and sturdy. Distributed by:

Arlington Industries, Inc., 79 Jefferson St., New York 2, N. Y.

MACHINE OF THE MONTH

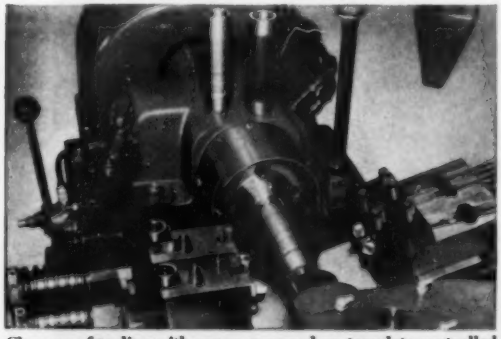
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing IMP LATHE FINISH TURNS 40 MM SHELL IN ONE OPERATION



Problem: To finish turn 40 mm high explosive shells, approximately 1.57" diameter x 5.17" long, maintaining close concentricity between OD and bore and obtaining an accurate, high-class finish.

Solution: The Automatic Lo-swing IMP Lathe was chosen for this work because its spindle construction with direct "V" belt drive permits turning with sintered carbide tools at the very high surface cutting speeds necessary to assure a polished finish. Also, other features of IMP design assured the rigidity and turning accuracy which this job demanded.



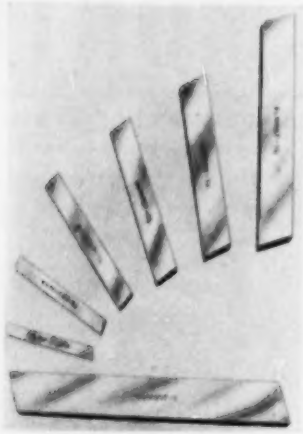
Close-up of tooling with covers removed on template-controlled tool blocks to show construction. Note rough and finish turned pieces on headstock. Work is first drilled, reamed and ends rough bevelled on an 8-spindle lathe before coming to the IMP.

The work is held and driven at the head end by an air-operated expanding collet chuck. The tailstock end is supported by a revolving, expanding bushing which enters the small diameter bore. The OD is turned the full length of the piece with 2 template-controlled tool blocks ... finish turning the nose, the boat tail and the cylindrical body. Simultaneously, a 3-tool block on the automatic back squaring attachment faces and chamfers one end and machines the cartridge crimping groove.

Movements of both front and rear slides are synchronized and the machine stops automatically with tools and slides returned to starting position. The tailstock is air-operated to speed up handling time.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

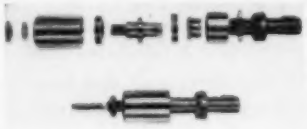


Du Mont HSS Tool Bits

Tool bits are made of a special HSS with a balanced carbon and vanadium content. An extra-fine grain structure is claimed to result. The bits are heated-treated to achieve 66 to 68 Rc and ground to close tolerance without decarburization. Their performance is claimed to compare with cobalt-steel bits in all cases where extreme heat resistance is not a major factor.

The tools are offered in squares with both ends beveled 20° in nine sizes, from ¼ in. square by 2½ in. long to 1 in. square by 7¼ in. long.

The du Mont Corp, Greenfield, Mass.



Floating Tap Holder For Multiple-Spindle Machines

The new JT floating tap holder, designed for use in multiple-spindle machines, has the same double-gear spline-drive coupling for the neutralizing or intermediate driving member as the previously designed JA holder. Clearance between mating splines allows free movement. Two thrust bearings, placed close together and separated from the drive, minimize effect of force applied on the tool by the hole, and permit taps to float freely into alignment.

Additional features include: small body dia for operations on close centers; short projection requiring less space between spindle and work; collet split on 4 sides to center tap by the shank, reducing strain and damage; quick-lock nut locks any place on the threaded adapter shank, permitting easy adjustments; balls are free to move or rotate around the collet, reducing scrubbing action characteristic of small rocking movements.

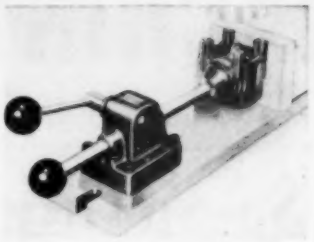
Scully-Jones & Co, 1902 South Rockwell St, Chicago 8, Ill.

Lightweight Electrode Holder

300-amp Model A-732 Twecotong electrode holder features a lightweight, high-copper alloy for maximum conductivity. Raised upper lever allows ample room for operator's hand with a welding rod in the jaws. Body and tip ends are fitted with a company's Super-Mel insulators.

Unit handles from 7/32-in. through 1/16-in. electrodes. Welding cable may be soldered or clamped mechanically to body of holder. Its 9¼-in. length facilitates welding in difficult areas.

Tweco Products Co, P O Box 666, Wichita, Kans.

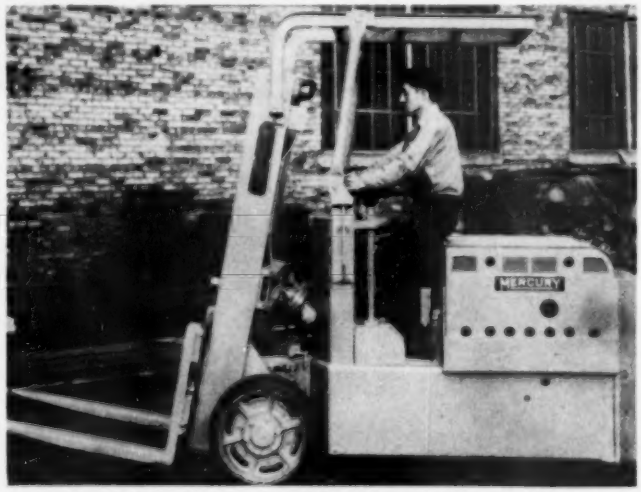


Fixture Lock Eliminates Need For Special Locking Details

This screwless, quick-acting locking device for adapting to jigs and fixtures eliminates need for clamps and holding tools. A push or pull on the bar knob sets the Heinrich Grip-Master fixture lock at any position between fully open or fully closed; light pressure on the locking lever gives an extra forward motion to the bar, exerting a holding pressure up to 1500 lb. Full and half-scale templet sheets are provided by the manufacturer.

Long stroke provides wide work clearance. A 1-in. portion of the end of the bar has been left soft, permitting machining to fit the device to specific jobs. Rest of bar and lock are hardened and ground.

National Machine Tool Co, Racine, Wis.



OVERHEAD GUARD, designated SA-1484-89-10, can be installed on both the Yak and Yank lift trucks. Canopy has an over-all installed height of 95 in., which can be reduced to 91 in. Guard is pivotally attached to the lifting mast and support from the lift-truck dash, which permits it to remain horizontal, regardless of degree of lifting-mast tilt. Because of its construction, top-removal of batteries may be easily accomplished.—*Mercury Mfg Co, 4044 South Halstead St, Chicago 9, Ill.*

Century Motors are designed for stamina, engineered for long, dependable service, carefully tested and balanced for precision performance.

What's more, you can select a size and type of Century Motor that's exactly right for your particular job. They're built in sizes from ⅛ to 400 h.p.—to meet all kinds of atmospheric or plant operating conditions.

Why settle for less than a Century, when you specify your next electric motor?

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1806 PINE STREET • ST. LOUIS 3, MISSOURI

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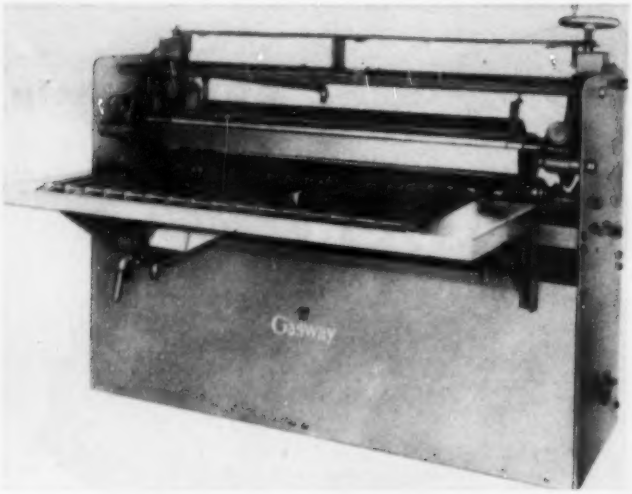
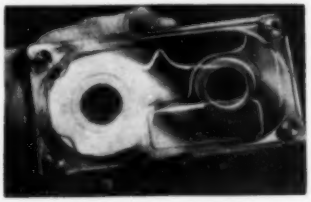


Coater With Six Accessory Kits Handles Wide Range of Materials

32-B Rollacoat Finisher, equipped with six accessory material-handling kits, can coat material up to 48 in. in width and 3 in. in thickness at speeds of 30 to 90 fpm; higher or lower speeds are available on special order.

Among kits are included: a standard feed table with adjustable edge guide; feed-conveyor kit which can be added to table, converting it into a short belt-feed unit; delivery-table conveyor kit which can be mounted on rear of machine to carry small finished pieces far enough away from machine to permit them to drop onto a drying conveyor; a pair of driven feed rolls which can be mounted on the front of machine in place of feed table.

Gasway Corp, 6465 North Ravenswood Ave, Chicago 26, Ill.



Magazine Recorder Monitors Variable Factors In Any Field

This basic recorder is designed to record factors in anything that varies, i.e., punch-press operation, duration of current flow, stresses and strains. Unit is plugged into a 110-v source, connected with a microswitch to object to be monitored, and a permanent record of 2 actions, plus time the action took place is made on a super-sensitive direct-recording paper known as Alfax.

The 6 7/16 x 3⅝ x 2⅝-in. magazine consists of recording electrodes, timing switch, and paper reels containing an 8-days' supply; driving unit contains a synchronous motor with pinion gear to engage and drive one of the reels, 4 resistors and a rectifier to provide dc signal of a few mils to mark the paper.

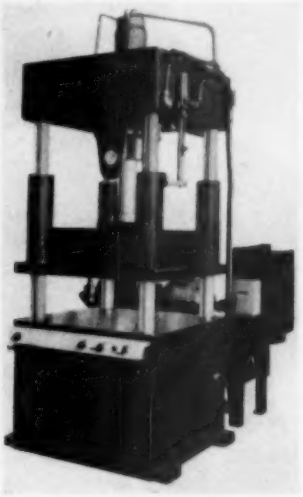
Alden Electronic & Impulse Recording Equipment Co, P O Box 185, Westboro, Mass.

7-Speed Production Drills

A new line of ¼-in.-capacity portable electric drills has a free drilling speed range of 600, 800, 1000, 1750, 2500, 3500, or 5000 rpm; pistol grip, spade handle, and center contour handle designs are available.

Operating freedom is achieved through compact size and weight of 3½ to 4 lb; lightweight aluminum construction is coupled with balanced armatures and precision-matched gears to reduce vibrations. The three models feature ac-dc motors, and are available for either 115 or 230 v, 25- to 60-cycle current.

Mall Tool Co, 7725 South Chicago Ave., Chicago 19, Ill.



Dake Guided-Platen Press For Molding Reinforced Plastics

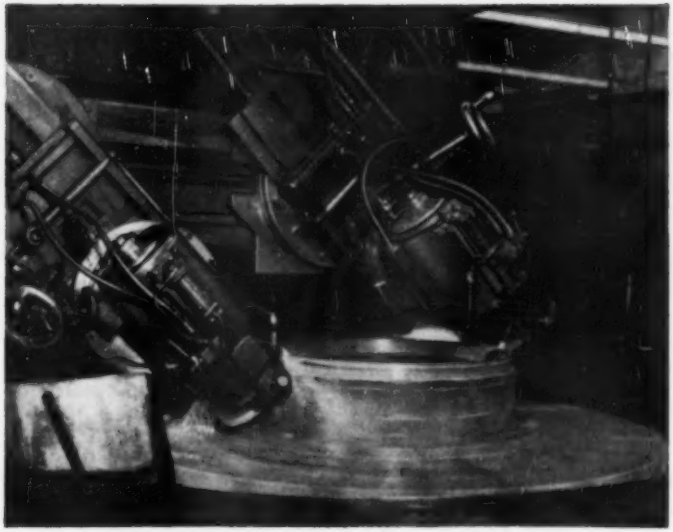
Dake plastics presses are electrically powered and hydraulically operated. They are built of welded steel throughout, and thus have the rigidity necessary for the accurate molding of plastics.

Dual palm-operated switches assure operator safety. When the switches are pressed, the moveable platen advances quickly to the work, just before contact it slows down automatically under the control of a limit switch with adjustable stroke. Heated platens can be furnished if needed.

An adjustable switch limits the pressure applied during the cure to any desired amount from half to full rated load. An electric timer retains this pressure for the duration of the curing cycle—adjustable from 12 to 400 sec. At the end of the cycle the moveable platen returns automatically to starting position.

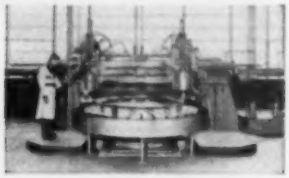
Standard press capacities range from 25 to 300 tons. They can be custom engineered to meet specific requirements—for instance they can be air-operated instead of electric; they can be supplied with up-acting moveable platens; and varying platen sizes can be furnished as required.

Dake Engine Co, Grand Haven, Mich.

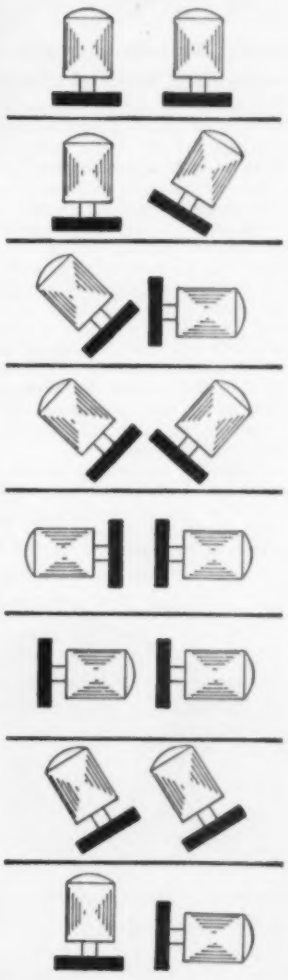


Simultaneous grinding of both raceways of 63" Biangular-type precision roller bearings with Frauenthal Grinder

World's Largest Multiple-Head Super-Precision Cylindrical Grinders



The diagrams below show a few of the many combination settings of Grinding-Spindle positions, suggesting the great versatility of these unique grinders:



Now you can do "impossible" precision grinding jobs with FRAUENTHAL GRINDERS

You can grind diameters and parallelism of faces on big parts, with Frauenthal Grinders, to the close tolerance of .0002" consistently . . . and produce angular accuracy of less than .0005" tolerance in 72" for flatness, squareness, concentricity, roundness and taper. Uniformity of precision is assured. Investigate FRAUENTHAL Multiple-Head Super-Precision Cylindrical Grinders.

IN 10 STANDARD SIZES • ALL SIZES MADE TO ESSENTIAL J. I. C. SPECIFICATIONS

	SERIES 1800				SERIES 2000		SERIES 2200			
TABLE SIZES	30"	36"	42"	48"	60"	72"	100"	120"	130"	140"
MAXIMUM SWING	56"	56"	56"	56"	72"	88"	120"	130"	140"	150"

Ask for Bulletin

FRAUENTHAL Division

THE KAYDON ENGINEERING CORP.

930 WEST SHERMAN BOULEVARD • MUSKEGON, MICHIGAN

* GRIND OUTSIDE • INSIDE • and FACES SIMULTANEOUSLY *

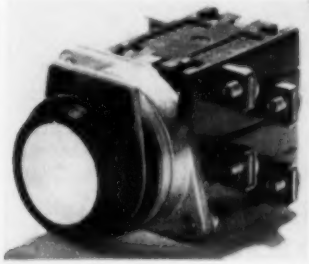
Portable Air Compressor with Automatically Regulated Pressure

The Model B-100 air compressor has a 12-gal. stainless-steel receiver; a V-belt driven, ½-hp, 1725-rpm capacitor motor; pressure gage; safety valve; drain cock; and semi-pneumatic rubber-tired steel wheels.

The unit has a 10-in. fan-spoke flywheel for efficient cooling. It is single stage, single cylinder, with a 2-in. bore and 1¾-in. stroke. Displacement at 100-lb pressure is 2½ cfm. The piston is made of alloy iron with two compression and one oil control ring, has Permite connecting rod, disk valves are made of clock spring steel, with each valve removable for inspection without disturbing other valves.

Accessories consist of 25 ft of coupled air hose, air chuck, and air blow gun. List price—$160.

National Tool & Equipment Co, 1807 W Lake St, Chicago, Ill.



Removable Coloring on G-E Oil-Tight Pushbuttons

Oil-tight pushbutton units for machine tools are designed on the building-block principle featuring self-aligning contacts and removable color rings.

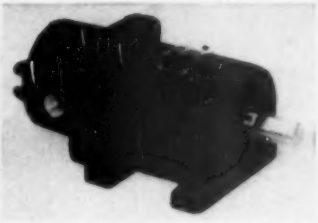
The building-block construction means the basic units can be arranged in various combinations to meet all special and standard requirements. For example, two operators, five color rings, and two contact blocks can be arranged in any of twenty different combinations.

The color rings—available in brilliant shades of black, red, green, yellow, and white—are attached by screwing the ring onto the neutral-colored button. Because ring is away from the area of use, it does not become discolored from dirt.

The self-aligning double-break contacts are placed at an angle so they close with a rolling action. The operating lever strikes a curved surface on the movable contact, assuring retention of alignment. The movable contact thus adjusts itself to wear so that there is always simultaneous breaking of contacts. Also, wear is distributed evenly over both contact surfaces which are covered with heavy silver overlays.

Only one basic form of contact block is used in the new units—a single-pole, double-throw made of Melamine for maximum arc resistance. Double-pole, double-throw combinations are made by mounting two of these units on the same base, and tandem combinations can be made by combining four blocks with an adapter plate.

General Electric Co, Schenectady 5



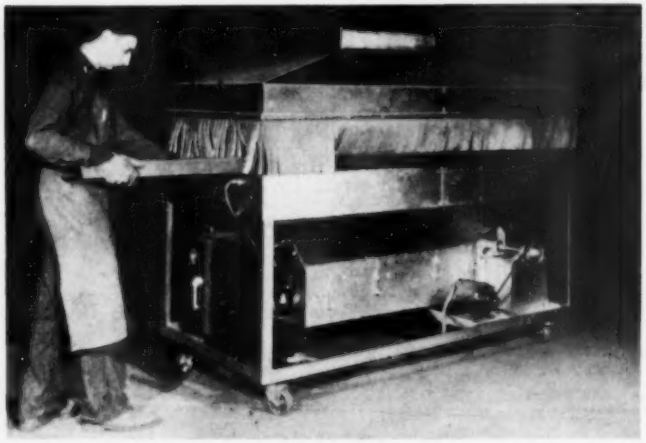
Heavy-Duty Tachometer Heads

Series 56M heads when used with Metron tachometer indicators, recorders, or controls can measure speeds between 200 and 10,000 rpm, and can be overspeeded 2 to 10 times without damage.

The stainless-steel head shaft is ¾ in. dia and supported in sealed ball bearings. All working parts and terminals are enclosed against dirt, abrasives, and splashing liquids. Electrical connections between head and indicator can be up to 1000 ft long, using either conduit or armored cable. Connections to the head can be made from four different approaches and the head can be mounted in any position.

Permanent lubrication for a high temperature range is employed. All heads of the same type number are interchangeable and require no special matching or adjustments.

Metron Instrument Co, 432 Lincoln St, Denver 9, Col.



PORTABLE ELECTRIC FURNACE heats aluminum bars to 300 F prior to forming. The heat-treating is required because of the special composition of the aluminum—if forming was done prior to the heat treat, the bars would have a tendency to crack when bent. Oven size is 3 ft wide by 6 ft long by 8 in. high; a blower provides recirculation of the heated air. A semi-closed opening for feeding and discharging the long bars is provided by means of an asbestos strip curtain. Controls include temp indicator and controller, instrument transformer, magnetic contactor switch box, and motor starter. Power requirements are 36 kw, 440-v, 3 phase.—*Peremy Equipment Co, Columbus, Ohio*

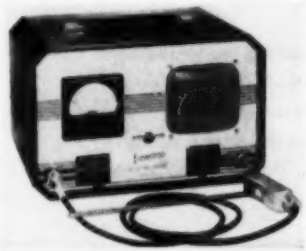
Check these features that make Universal drill bushings outstanding: 1. Super finish reduces wear to a minimum. 2. Blended radius reduces tool hang up. 3. 100% concentricity and hardness tests assure accuracy. 4. Knurled head provides quick sure grip. Order from the office nearest you ... 1060 Broad St., Newark, N.J., 5035 Sixth Ave., Kenosha, Wis., or write direct to our home office.

Air-Operated Portable Driller For up to 2¼-in.-Dia Holes

Togglebug drill is an air motor capable of variable spindle speeds ranging from 150 to 600 rpm. It operates on 100 psi and consumes 150 cu ft of air at maximum load. A ¾-in. line should be used so adequate air can be supplied.

The model will drill, ream and countersink up to 2¼-in. diameter holes. Machine is also available equipped with electric or gasoline power.

The Guibert Steel Company, Pittsburgh, Pa.



Electronic Vibration Pick-up Has Visual Calibrated Meter

By employing a pick-up probe and 3-stage amplifier, the Electro-Probe picks up vibrations at points of contact, but is unaffected by airborne noises. Speaker and head phones provide audible comparison of vibration sounds within a range of 60 decibels; calibrated meter gives visual indication.

One of its uses would be in detecting and diagnosing trouble developing in running motors or machines before failure occurs. In inspection work, it can be used to establish a reading for an acceptable part or assembly; others off the production line can be quickly passed or rejected on comparative readings. Addition of an accessory item permits use of the probe as a surface gage.

It operates on 36 watt, 110-120 v, ac, 60 cycle. List price is $110.

Erwood, Inc, 1770 Berteau St, Chicago 13, Ill.

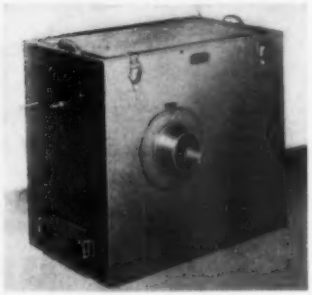
Permanent-Magnet Pulley With Cross-Pole Pull

Radial Design magnetic pulleys allow the ferrous material to bridge the magnetic gap—otherwise impossible with ordinary parallel-pole pulleys. Result is up to 4 times more powerful attraction, because of magnet placement perpendicular to the circumference of the pulley.

The pulley replaces the head pulley of a belt conveyor, thus converting it into a magnetic separator. Material carried on the belt passes over the magnetic pulley, which holds the iron particles to the belt until they reach the underside, pass out of the magnetic field and are discharged.

The pulleys are made of Alnico 5, in standard sizes up to 24 in. dia. Larger sizes are available for special jobs.

Magnetic Engineering & Mfg Co, Clifton, N. J.



Heavy-Duty Portable Dehumidifier With Time-Delay Action

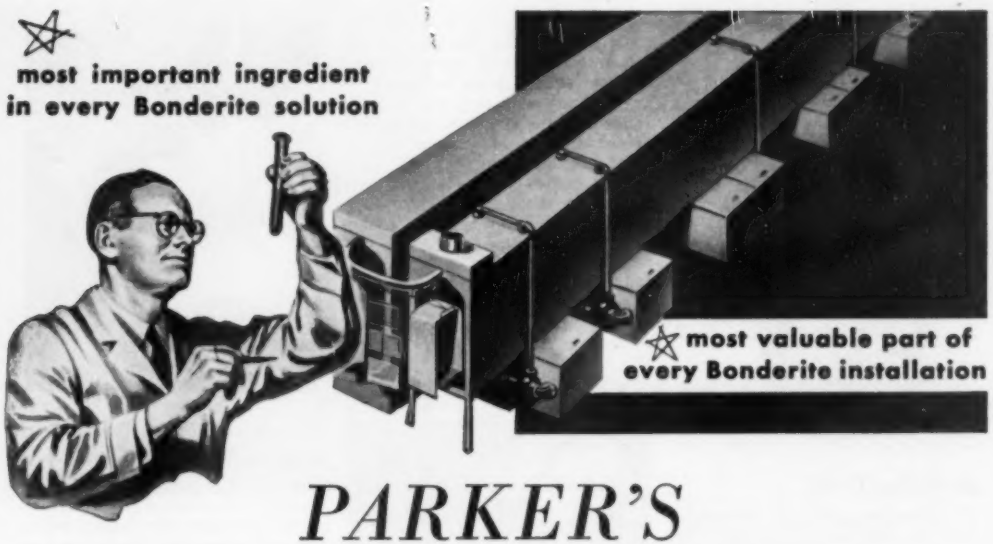
Time-delay action on this dehumidifier means that the drying material is thoroughly dehydrated and cooled before the unit switches back to the drying phase. The time delay prevents undue rise in temperature in the room during the beginnings of the drying cycle, and increases the units drying efficiency by 20%.

The unit functions by drawing humid air through a permanent dehydrating agent—a combination of activated alumina and silica gel—then discharging the dry, dust-free air back into the room.

The unit works in cycles: dries for 2½ hr; then vaporizes the absorbed moisture for 30 min, switching from the drying to the reactivation phase automatically without external control. Since the drying element is constantly reactivated by the built-in heating element, it has an indefinite life and needs no replacement.

Known as the Model 25CT, it draws a max of 0.96 Kilowatts from a 110-v, 60-cycle, single-phase line. The self-contained, 24-watt, 1/100-hp rotor fan motor is capable of moving 32 cu ft of air per min through the machine.

Dryomatic Corp, Alexandria, Va.



PARKER'S ☆37 YEARS' EXPERIENCE

in surface treatments for metals

No one—no individual and no other company—has the experience and knowledge of surface treatments for metals that Parker Rust Proof has.

Backed by this invaluable know-how, Bonderite today is more efficient, more economical, more versatile than ever!

No need to experiment, no need for you to use untried products or methods. Parker, calling on its 37 years of experience, will plan a Bonderite treatment to fit your production requirements exactly and produce the results you want.

Bonderite, corrosion resistant paint base, is one of the most thoroughly proven products available to American industry. And it is sold and serviced by the company which has been the leader in the field since 1915.

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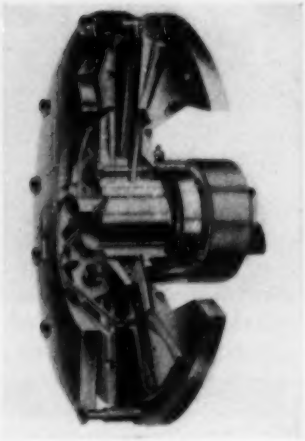
BONDERITE and BONDERLUBE — ... of metals
PARCO COMPOUND — ... rust preventives
PARCO LUBRITE — ... for ... surfaces



Air Friction Clutch

The Flex-Disc clutch is claimed to have the following advantages: no moving parts to wear; never requires adjustment; will not burn out, clog up or be affected by oil or water; longer friction-surface life due to uniform plate pressures and air-cooled operation; alloy-steel construction that requires less shaft space.

Unit is available in single and multiple tube and plate design; either spring engaged and air released, or air engaged and spring released.

Cardwell Manufacturing Co, Inc, Clutch Div, Wichita, Kansas.

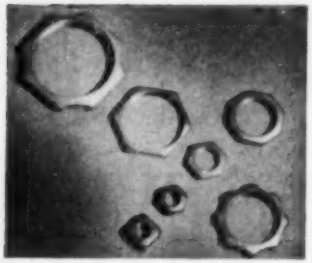
Roller Plunger on Micro Switch Adjustable to Align with Cam

This snap-action switch designed for cam-actuated service can make or break steady state currents of 20 amps, and handles inrush currents of 75 amps.

The switch has a roller plunger actuator adapted to operation by cams with a rise of up to 30°; BAF1-2RQ9-LH (or RH) has plunger on left or right side of the enclosure. Plunger assembly can be turned to any position necessary to align its roller with the direction of cam approach; assembly is securely clamped by tightening a nut.

The single-pole, double-throw units have a 2½-lb max. operating force, a ¾-lb min. release force, and are listed as follows: ¾ hp, 115 v ac; 1½ hp, 230 v ac; 20 amps, 125, 250, or 460 v ac; 10 amps, 125 v ac; ½ amp, 125 v dc; ¼ amp, 250 v dc.

Micro Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill.



Line of Cold-Punched Nuts

New production methods enable these cold-punched nuts to be turned out at substantial savings, according to the manufacturer. Sold in bulk quantities only, the product is available in steel, brass (plated or unplated), and stainless steel.

Line includes conduit locknuts, machine-screw nuts (square or hexagon), and electrical fixture nuts; special types can be supplied upon specification.

Jacobson Mfg Co, Inc, Kenilworth 5, N. J.

Combination stopwatch and revolution counter enables one man to check the speed of motors, machinery, rotating shafts, etc. Rubber tip is pressed lightly against revolving shaft, and counter idles. When pressed a little harder, counter and stopwatch are simultaneously engaged and running. When released after specified time interval, revolutions per interval can be read directly from the dial. Knob is then turned in order to reset counter to zero; simultaneously rewinding the stopwatch. Maximum speed is 5,000 rpm, price $35.

Montgomery and Co, Inc, 53 Park Place, New York 7, N. Y.

Three-Spindle Turret Head Permits Sequence Work on Drillpress

Called Select-A-Spindle, this tool provides a selection of speeds on each of three spindles for drilling, reaming, counterboring, and tapping at recommended speeds. Capacity on all three spindles is ⅝ in. Adjustable torque control units for the protection of taps up to ¼ in. may be supplied for any or all spindles.

Hand-lever indexing of the turret head can be done without stopping the drillpress motor. The tool rotates only after the spindle is indexed and automatically locked. Tapping may be done on any one, two, or all three spindles.

Sequence operations at proper speeds can be done without removing work from jig or fixture.

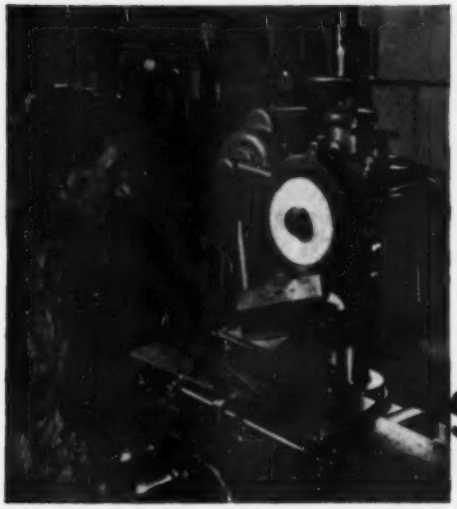
Commander Manufacturing Co, 4225 W. Kinzie Street, Chicago, Ill.

6-Jaw Chuck for D-S Grinder

6-jaw chuck for the D-S radial relief-grinding fixture facilitates grinding tools not readily held in a collet, or for which no adequate-size collet is available.

The 4-in. Buck model chuck has a shank, precision ground for the D-S spindle, with integral adjustable back plate added to the body; this is said to assure concentricity within 0.0005 in. total indicator runout.

Royal Oak Tool & Machine Co, (D-S Grinder Div), 619 East Fourth Ave, Royal Oak, Mich.



"HIGH OUTPUT OF QUALITY WORK— NO LOST TIME FOR MACHINE FAILURE with DELTA SURFACE GRINDERS"

Operating a battery of Delta Toolmaker Grinders for all grinding operations, Tool Service Company of Milwaukee has won an enviable reputation in the Milwaukee industrial community as expert conditioners of tools.

As designers and grinders of cutting tools and bits, Tool Service praises the versatility, dependable accuracy and ease of operation of Delta Grinders—says that it maintains a consistently high output of highly special quality work with no lost time because of a machine failure.

Wherever tools have to be sharpened and resharpened—from small shops up to big tool departments—there's a need for the basic quality in Delta Toolmaker Grinders. Ruggedly built, designed for easy, simple, economical operation, Delta machines are distinguished for their accuracy.

THREE TYPES OF DELTA TOOLMAKER® to meet every grinding need....

TOOLMAKER SURFACE GRINDER

A big, massive machine with the stability to assure accuracy. Rapid, close adjustments are easy. The motor pulley and motor are balanced together to assure a minimum of vibration. The wheel and adapter can be removed and replaced with no further truing-up.

TOOLMAKER CHIP-BREAKER GRINDER

A precision machine for grinding the chip-breaker groove in carbide tipped tools. Of exceptional value is its special feature, the Univise—massive, rigid—can be set securely at *any conceivable angle*, and can be reset accurately in a few seconds. Easily and quickly adapted for use on the surface grinder.

TOOLMAKER TOOL AND CUTTER GRINDER

Ideal for sharpening milling cutters, reamers, taps, end mills and many other cutting tools, this versatile grinder helps to achieve extreme accuracy on a high production basis. The table swivels a full 90 degrees, with a graduated scale and positive lock—practically every angle can be easily and accurately ground.

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ROUND TABLE Discussion

PLAY BALL

Does time off for the baseball opener raise or lower shop morale? How can the problem be handled if you suspect half the men will take the day off anyhow? Some of our readers say —

I DON'T BELIEVE in giving in to everything asked by an employee; there are times when one has to be firm. However, when the shop, collectively, makes a request to proclaim a holiday for some important event, it is to the benefit of all concerned to grant that request. The workers will return to their jobs, happy in spirits and physically improved providing they didn't go overboard in their celebrating.

Here's what usually happens when such a petition is turned down: You'll have a few well-regulated individuals who are able to control their emotions and the refusal will not affect them. But there will be others who will burn with resentment and will either stay away for the day anyhow or else keep the timeclock running for their financial benefit while they grumble along doing as little as they possibly can.

I do not see how Al can consider himself a normal human being and not get a thrill out of the opening game. He claims that he has outgrown such things and that there is a time and a place for everything. Sure there is a time and a place. It is the next afternoon when the sun shines down on all living things and the place is in the bleachers or the grandstand.

A day off for the opening game does not break up an organization, as Al claims. It is decidedly good business for the men to have a safety-valve session wherein they can dissipate their gripes at the expense of the umpire instead of the firm.

Jack Everett
San Francisco, Calif.

•

MY FATHER was a station master on the Pennsylvania Railroad for over thirty years before he died. He worked seven days a week, and there were no regular days off. Stores and banks closed on Christmas and other holidays, but the railroads kept right on operating.

I worked in the traffic department of a railroad, and I too worked seven

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For this reason MAXIPRESSES are being chosen for the vast portion of the American, Canadian and British jet forging installations.

These fine, newly redesigned, high speed forging presses, embodying 23 new features, are specially suited to the most difficult present-day work, and by the same token will be the most reliable forge-shop equipment for future use as well.

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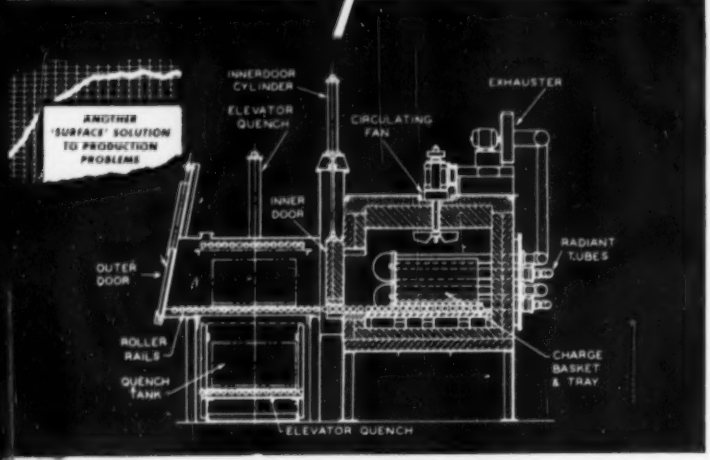
'Surface'



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✓ Radiant Tube-Fired
✓ Enclosed Liquid Quench

High production and controlled atmosphere treating . . . with the new 'Surface' Standard *Allcase* batch furnace!

● With maximum production rate of 500 lbs/hr gross, and uniform temperatures between 1400 and 1750 F, this furnace offers high production at minimum capital investment.

Removable, piloted *Radiant Tubes* manifolded to exhauster.

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Enclosed Liquid Quench, atmosphere-protected; propeller type agitation and mechanized quench provides rapid direct quenching.

Slow Cool Chamber, with forced circulation and heat exchanger elements, can also be supplied.

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What can the Standard Allcase furnace do for you? Send for full information today.

* *Allcase is a trade name of Surface Combustion Corporation.*

SURFACE COMBUSTION *Corporation*
TOLEDO 1, OHIO

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days a week. I didn't like it, but it was that type of a job.

Later, I worked for a mining company that granted four holidays a year, Christmas, Fourth of July, New Year's Day, and Labor Day. To the office men, those days were real holidays; they were paid for them. Those of us in the shop simply had a day off for which we were not paid.

From experience, I can't see any great harm in a day off, but possibly a lot of good if men were granted an afternoon to see a ball game. But there you run into trouble. Some of us prefer football, and some of us like horseracing. I know several shops in the east that close down the day the Narragansett Race Track opens. I know men that want to be off the first day of fishing season, and others who want to be off the first day of the hunting season.

Which is the best day? I wouldn't know. I do not think it is possible to satisfy everybody in a large plant. I do think it is possible to come close to satisfying everybody by setting aside one day for a shop or plant picnic to which the workers can bring their families, their sweethearts and their boy-friends. I personally have worked in several organizations where annual picnics were held, and I have bright and pleasant memories of them. I hope to live long enough to see the day when all large companies will set aside one day for a plant picnic, and will pay their employees for that day. I want to see the helpers and the sweepers paid, as well as the engineers, the office folks and the brass. THAT will be the day.

James K. Matter
Detroit, Mich.

•

IN HONOR OF AMERICA'S greatest sport I would turn off the propelling juice of industry and let the cockeyed world spin on its axis for the afternoon.

Were I an employer I would furnish each of my workers with a large bag of peanuts—unshelled, of course—and a couple of bottles of pop with the stern injunction that the empty bottles be returned to the shop instead of being thrown at the umpire's head.

While the big shots in industry delight in having their ego refurbished by a round of golf followed by the joyful clicking of glasses anytime they feel so disposed, no one should object to the worker having time off to celebrate on the one great day of the year when the initial throw across the plate inaugurates the baseball season.

Practical Assistance

Whether it's getting out of a fishing tackle tangle, or unsnarling a *cutting oil snag* on your production line . . . practical assistance, the kind that gets you off the hook fast, is the thing you look for most.

And ***PRACTICAL TECHNICAL ASSISTANCE*** is a Cities Service specialty.

Cities Service Lubrication Engineers can offer every machining operation practical assistance that will mean dollars, man-hours and equipment saved. These specialists recommend the most effective lubricating practices, and they offer the most complete line of quality cutting fluids.

but check for yourself:

✔ Check the high quality of Cities Service cutting fluids. Check operations similar to yours, or better still, test them on the job.

✔ Check the *complete* Cities Service line as an ideal, single source for the correct cutting fluid for every need. Deliveries are quick, accurate and dependable.

✔ And finally, discuss your problems with a Cities Service Lubrication Engineer . . . he's probably solved many like them in manufacturing plants throughout the country. He wants to help you. He can help you. Write or phone CITIES SERVICE OIL COMPANY, Dept. G37, Sixty Wall Tower, New York City 5 . . . or get in touch with the office nearest you.

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Jarvis Factory trained representatives are ready to assist you select the Machines you need. For further information and Catalog of Jarvis Flexible Shaft Machines, write directly to The Charles L. Jarvis Company, Middletown, Connecticut.

Jarvis POWER TOOLS

THE CHARLES L. JARVIS CO.
MIDDLETOWN IN CONNECTICUT

The factory worker should have his holidays so as to permit him a little change of scenery now and then. Life isn't a bed of roses for the poor sucker; he shuts off the alarm, gulps down his breakfast, backs out the car and scrambles through the highways, punches the clock and slips into his overalls, then labors over the same old thing day in and day out. What a life to have to live without a holiday now and then.

All work and no play makes Jack a dull boy; all loaf and no pay makes a darn sight duller boy. Let's strike a happy medium wherein a man can do his best on the job and occasionally take a day off to re-align his molecules by raising hell. Starrike three!

J. Homewood
Ontario, Calif.

•

VARIETY SHOP

YES, IT'D BE a good thing to standardize on equipment, but the trouble is that it can never be realized for several reasons. In the first place, one manufacturer could probably never supply the machines necessary in any particular shop to meet the demand of delivery in a given time. That gives the other manufacturer a chance to sell his machines.

Furthermore, competition between several manufacturers is absolutely necessary to make possible advanced designs and low prices. One manufacturer cannot possibly produce even one particular type of machine to meet all demands in a toolroom or in a shop where the product is diversified. In some kinds of special mass production, perhaps it is possible.

Lathe hands, milling machine operators, or other machinists are as a rule not shifted from one machine to the other. Usually they have plenty to do on the machines they are put to run. Undoubtedly, one must get accustomed to a certain machine to run it efficiently, but this is not a serious issue since each man works the machine he is used to running.

The problem of testing the machines to see which of them is best doesn't only involve the machine proper, but also the tools used and the skill of the men carrying out the test. And one single test conducted a certain day might not be of much value, since the real value of any machine tool cannot be revealed until used for several years. Again it may take many years for a manufacturer to prove that his

machines are as good as those made by his competitors and thereby gain a name for his product.

In mass production one may find dozens of machines exactly alike, which perhaps will prove that it is easier to standardize in regular manufacturing than on diversified work.

I agree with Ed, that a shop equipped with many kinds of machines is more adaptable to a variety of jobs, but, of course, this fits best the toolroom or small shop. In the larger manufacturing plants the proposition is entirely different; there the machines are specialized on a few operations each.

A. E. Fristedt
Stockholm-Bromma, Sweden

•

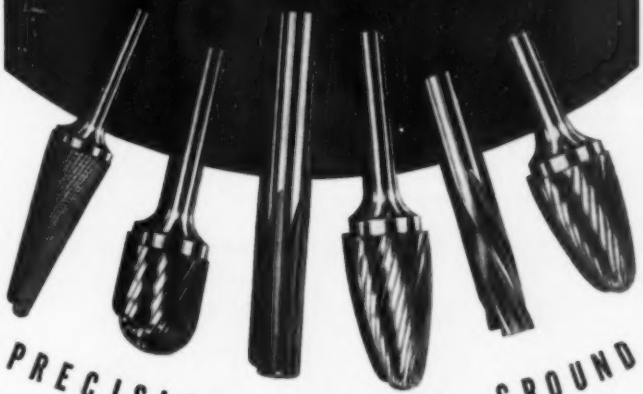
STANDARDIZATION is all very well unless we go overboard and lose sight of the advantages of versatility. There is no doubt that one make of machine would have its advantages in simplifying repairs and promoting a high degree of operating simplicity. When standardization is taken too seriously it amounts to stagnation in a sense, because no one machine is perfect. It is in variety that one is able to note improvements. No one machine is capable of handling all jobs to the best advantage. It is in the operating of the machine that one senses the degree of superiority.

Some men are inclined to favor a certain lathe, especially when they are cutting threads. It is advisable to have a few machines around whose lead screws are different in order to facilitate the cutting of multiple threads. You'll always find that the conscientious fellows will let out a complaining howl if someone in authority orders a machine simply from the standpoint of its low initial cost.

I think that the toolroom should

"The interviewer was very nice . . . he said he thought they would have an opening in the spot-face department for me."

Jarvis
SOLID
TUNGSTEN CARBIDE
TOOLS
INDUSTRIAL TOOLS FOR INDUSTRIAL USERS



PRECISION MACHINE GROUND

Quality

ROTARY FILES • REAMERS • BORING BITS • END MILLS
TAPS
TORQOMATICS
MULTI-TAPPERS
FLEXIBLE
SHAFT MACHINES

WRITE FOR
ILLUSTRATED CATALOG

THE
CHARLES L. JARVIS
COMPANY
MIDDLETOWN IN CONNECTICUT

YOU *Can* AVOID DIE COSTS COMPLETELY!

Yes, you can -- but it's not *necessarily* the best thing for you.

You want the lowest unit cost -- *for the life of the part*, including re-runs. It may well be that our **Machine-Cut Method**, with no die cost, does work out best.

Or, it might better be our **Short Run Method**, using economical blanking dies and stock punches.

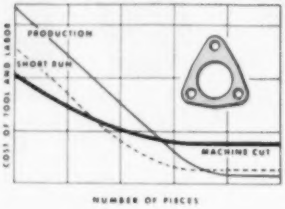
Sometimes, even with very short runs, it pays to use our **Production Method** with a standard die or our own surprisingly inexpensive Hecht-type tool.

In *any* case, the decision is a technical one based on many factors, not just length of run. You save money when the correct decision is made.

WE USE ALL THREE METHODS — LET US MAKE AN IMPARTIAL DECISION FOR YOU

For example, take the part illustrated. From 1-65 parts, our Machine-Cut Method is most economical. At 65 parts, the Short-Run Method is best until, at 7,000 units, the standard Production Method is most satisfactory.

These breaking points as charted vary drastically with every stamping, but the general principle remains the same.



LAMINATED SHIM COMPANY, INC.

Manufacturers of ALL TYPES OF SHIMS

STAMPINGS DIVISION

"ONE PIECE OR ONE MILLION"

STAMPINGS DIVISION, LAMINATED SHIM COMPANY
3107 Union Street, Glenbrook, Conn.

Gentlemen:
Please rush me my free copy of "SERVICE IN STAMPINGS"—the 12-page, illustrated booklet full of helpful facts on the economical buying of stampings.

NAME _____ TITLE _____

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be equipped with various makes of machinery—it should be the laboratory in which machinery could get its proper appraisal. The proper amount of investigation and research should accompany any purchase of a machine to be used in high production. There is a certain amount of lost time caused by men jumping from one make of machine to another, but it doesn't amount to anything, inasmuch as a man of experience soon adapts himself to new conditions.

J. Homewood
Ontario, Calif.

•

MANY FACTORS ENTER into the selection of machine tools needed for the most satisfactory results; the volume and variety of shop work demand first consideration.

To meet the needs of a great volume of output demands the best of standard machine tools. Often where the volume required is exceptionally large, it is profitable to use specially-designed machine tools, special handling equipment, and the very best of cutting tools. Although the cost of designing and building is very high, the efficiency of such special equipment will be found profitable in the long run.

As the volume of work decreases, carefully selected standard machines are less costly. However, a portion of those selected must be large enough to handle the largest parts required, together with other smaller tools for the smaller parts.

While there is some advantage in having all machine tools of one make, it is not often that any one make builds the most efficient tools for a variety of work.

H. B. Martin
Watervliet, N. Y.

•

AL HAS BROUGHT up a subject, that of standardization, which has puzzled many a shop owner and his superintendent of production.

Where a standard line of production is manufactured and is sold in large quantities, it is a much more likely effort if the machines of production are of one make.

This refers to orders of 100,000 pieces or more; it would not apply to a small jobbing shop where an order for most anything may crop up. In one shop, an order came in to have a knitting machine designed and built and a barber's pole made up on two succeeding days, which indicates the variety of their work.

It is preferable in a plant where standard products are manufactured

Little fists with a king-size grip

Castings for pressure hose connectors

RADIOGRAPHY proves them sound

The grip that these little metal fists get must not only hold fast but be pressure-tight. They're hose connectors with a vital job to do. Any possible cause for failure must be discovered—and before expensive machine time is wasted.

So the manufacturer radiographs each casting. It's a routine which more and more foundrymen find pays off. It provides assurance that only sound work leaves the shop—builds a reputation for good work. And besides it often indicates ways production runs can be adjusted to give greater yield.

Wouldn't you like to know how radiography can help you in your operations? Your x-ray dealer will be glad to discuss it with you. Or, if you wish, we'll send you a free copy of our booklet "Radiography As a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, New York

Radiography . . .

another important function of photography

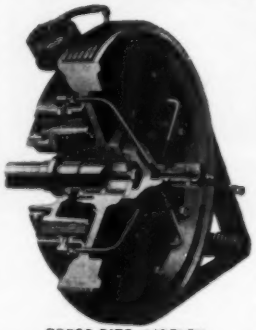
Kodak
TRADE-MARK

...the SPOTLIGHT is on the
PRESS-RITE
60 TON POWER PRESS
featuring...
• Press-Rite Airflex Clutch and Brake System
• One-Piece Heavy Duty Frame with Built-In Tie Rods
• Triple Ramway Lubrication
• Non-Repeat Single Stroke Mechanism
• Roller Bearing Flywheel

NOW . . . a 60-TON POWER PRESS . . . with all the PRESS-RITE Features!

Available in either flywheel or back-geared models, the Press-Rite No. 60 has an extra heavy uni-cast frame with built-in tie rods to practically eliminate deflection on heavy drawing and blanking operations. The Press-Rite Airflex Clutch and Brake System* delivers full stroke power through every operating cycle . . . provides positive, instantaneous braking action. Non-Repeat Single Stroke Mechanism provides absolute safety on single stroke operation . . . is easily changed for continuous operation when desired. Extra large die face simplifies handling of bulky dies . . . cuts set-up time. High production . . . low maintenance . . . long, dependable operation—these proven advantages make the Press-Rite No. 60 a profitable addition to your production line.

*Optional at extra cost on models 20-ton and larger.



PRESS-RITE AIRFLEX CLUTCH-BRAKE ARRANGEMENT

THIS DATA-PACKED BULLETIN . . . gives you full information on the Press-Rite line of 8 models . . . capacities 5 to 85 tons. If you are planning purchase of power press equipment, either now or at a later date, it will pay you well to study this bulletin first.

Write for Your Copy . . . TODAY!

PROMPT DELIVERY ON MOST MODELS

Sales Service Machine Tool Co. SSMT

PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS

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in quantities, to have much of the equipment standardized.

This includes electric motors, switches, transformers, brazing and soldering burners, valves, plumbing and heating items, welders, clutches and other goods, each in their line, made by one manufacturer, with parts and spares kept in stock.

Due to the carelessness of an electrician in one plant who let a 6,000-v primarily line down on a 220-v secondary circuit, 128 motors burned out simultaneously. Motors ranged from fractional hp up to 50 hp for operating an air compressor. There were eight different makes of motors and other items made by various manufacturers, all of which were engaged on war work.

The firm had six plants, all of which contributed spares and repair parts, but this calamity delayed production considerably and, as a large amount of this was parts made up for other factories, there were holdups all along the line.

As to the labor element of this subject, undoubtedly a man who was accustomed to a certain make of machine would be a better producer if he could have his customary machine tool to work with, but, in a toolroom, a good toolmaker producing a specific tool may be required to work with several machines.

Recently a new plant was built with the idea of having as few makes of equipment as possible; the plant engineer settled on one make of each line. He purchased motors, welders and transformers all made by one manufacturer; another company's products were listed as substitutes, to be bought in case of emergency when the regular line could not be gotten. This procedure was carried out in the case of valves, sanitary equipment, woodworking machines and other equipment.

"The foreman fired him for being late, and he's giving the time clock his final punch!"

Ed's baloney may satisfy because he is away behind the times and he has never known any other method of procedure, but, had he been brought up with progressive ideas, he would be a different man.

Several years ago a case occurred in which the crank brass on a big Corliss engine burned out. Delivery date on a new one was held up four weeks, so an emergency call to a jobbing shop was made.

The jobbing shop sent out one of their best men to look over the situation. Consequence? A hard babbitt bearing was poured, the engine was started and when the new brass finally arrived it was laid up on a shelf and stayed there for sixteen years or more. This was a case where a spare ordinarily would not be kept in stock, but a substitute proved to be quite satisfactory.

Last but not least in the discussion of standards, no two duplicate machines will work the same, and a first-class mechanic will bear this out. Like automobiles, some are very good while some are lemons and these latter are cussed to a fare-ye-well in all languages.

Looking at this proposition in the broadest sense, Al has a good idea, while, to buck any progress along this line would be the part Ed would play.

R. L. Grayford
Worcester, N. Y.

•

THE PURPOSES of a production shop and of a tool shop are so much different and their requirements in men and equipment so far apart that there is no comparison possible in the methods to be applied for the purchase of their equipment.

In a production shop, by and large, each machine must be capable of producing at a maximum rate within the accuracy called for on the drawings. This has been recognized by producers and manufacturers in the highly developed specialized screw machines, duplicating lathes, contour facing lathes, etc., attaining their highest expression in the combination machines developed for the production of automotive parts.

Once the most efficient design has been found, there is no good reason for buying other machines which, while perfectly satisfactory in themselves, will only complicate training and maintenance problems.

Of course, if the production shop is a job shop, its requirements are very much the same as those of a tool shop. Here the emphasis is on obtaining equipment that will lend itself to a maximum range of work—

How you SAVE ON
HOIST MAINTENANCE
WITH COFFING

...Quik-Lifts

Here are just a few of the "extras" that keep Coffing Quik-Lift electric hoists on the job, save maintenance:

- Gears are drop-forged alloy steel, hard-faced for extra wear, soft-cored for added strength. Teeth are larger, stronger.
- Moving parts run on lubri-sealed ball bearings.
- Pendant rope controls are used for more dependable and trouble-free service over the years.
- Load-holding parts are tested at 100 percent overload.

Quik-Lift electric hoists available in 17 models, 500- to 4,000-lb. capacities.

...Challengers

Coffing Challenger spur-gear hoists are completely new throughout...with new lightness, new strength, new design simplicity:

- Housing is formed steel plate—withstands shock loads and rough handling.
- Laminated steel back plate gives extra support to hoist mechanism.
- Has five-to-one safety factor, tested at 100 percent overload.
- Gears and bearings have lifetime lubrication.
- The Challenger has only 29 basic parts—simplest spur-gear hoist ever made.
- May be completely disassembled in minutes with ordinary tools.

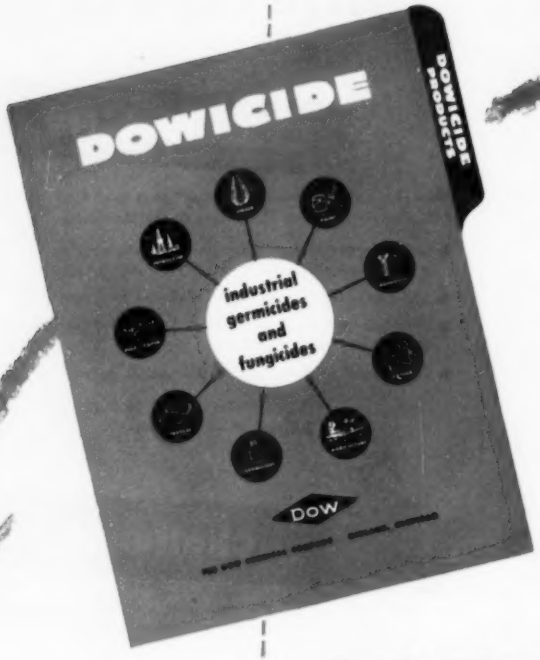
Challengers and other Coffing spur-gear hoists in capacities from ½ to 5 ton.

Test these points yourself. Pick out the toughest hoist job you have, install the right Coffing electric or spur-gear hoist—then see how little maintenance is required, how they *stay on the job.* For further information on Quik-Lifts and Challengers, write Dept. AM-7.

COFFING HOIST COMPANY
Danville, Illinois

HOIST-ALLS • SAFETY-PULL RATCHET LEVER HOISTS • MIGHTY-MIDGET PULLERS
DIFFERENTIAL CHAIN-HOISTS • LOAD BINDERS • I-BEAM TROLLEYS
Sold By Distributors Everywhere

The Complete Story of Proved Protection against Mold and Bacterial Attacks!



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against
MOLD
and
BACTERIA

mail this Coupon Today!

For the first time Dow offers you this easy-to-use, comprehensive file of information on Dowicide products . . . the time-tested industrial germicides and fungicides. The Dowicide product file tells how you can bring effective, economical microbial control into your plant. It assembles under one cover many suggested uses for Dowicide preservatives. In addition, it gives their formulas as well as their chemical and physical properties. Free your plant from costly attacks of mold and bacteria today. Send for your copy of the Dowicide product information file *without obligation.*

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

The Dow Chemical Company
Dowicide Division, Dept. DC101A, Midland, Michigan
Please send me the Dowicide Product Information File.

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I am interested in using Dowicide Products for _____

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

in general—with built-in high accuracy, and wide limits of speeds and feeds. Not all machines need cover all the requirements; we might have for instance a dozen or so good quality lathes — Hendeys, for example—with a couple of high precision Pratt & Whitneys, several Stark bench lathes and one Rivett and so forth, for milling machines, boring machines, grinders, shapers. The question of maintenance becomes secondary and the men, being machinists or toolmakers rather than machine attendants, will soon familiarize themselves with the difference in controls, lubrication, etc.

But even so, within limitations, it does not seem advisable to transform the tool shop into a museum, with one of each kind on exhibition. There are not enough fundamental differences between various makes to justify carrying a whole collection of repair parts for the sake of variety. Nothwithstanding Ed's ability to obtain spares, it takes more time than is usually available to get a machine back in service.

P. P. Fenaux
Lynn, Mass.

•

SHOP VEEP

SHORTLY AFTER I finished serving my time, I worked in a shop that had a quite ancient machinist whom we called "Judge." The Judge spent most of his time sitting on a bench, working on locomotive lubricators and injectors, and giving out advice.

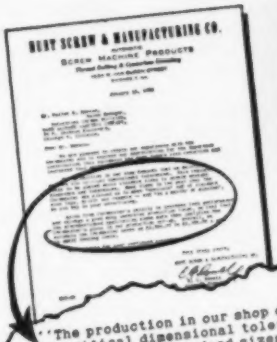
The Judge was the boss's unofficial assistant, methods man, efficiency expert, and advice-giver. When we were stuck on a job, we'd consult the Judge. His advice was sage and good. Without leaving his seat to visit the scene of the crime, he'd marshal the facts, sum them up, and pronounce his decision. Whether his advice referred to the best-known method of handling a shaft that was turned undersize, or whether he specified the exact amount of leeway which should be accorded a fast-stepping wife, the Judge was always on the beam. His advice was effective, and it worked. I wish he were still alive; I could use him.

In many plants and shops the foreman does have an assistant. In too many cases, due perhaps to the complexity of the organization, the natural tendency of people to "let George do it," the assistant-foreman idea doesn't work out so well.

I am presently employed as a materials engineer in the research division of a Government arsenal. A week ago one of my supervisors

"Saves $1,500 to $2,000 in small tool costs"

Here's how one manufacturer cuts costs and increases tool performance by using a Chromaster industrial chrome plating unit right in his own plant.


HUNT SCREW & MANUFACTURING CO.
SCREW MACHINE PRODUCTS

"The production in our shop demands that we maintain extreme and critical dimensional tolerances. This requires tools to be plated above standard sizes to obtain unusual diameters and tolerances. Many times in the past year the Chromaster has allowed us to make 'specials' out of standard size taps, drills and reamers—and 'in a matter of minutes'. Over-all, we estimate the Chromaster saves us $1,500.00 to $2,000.00 a year in small tooling costs."
writes E. G. Dowell, General Manager, Hunt Screw & Manufacturing Co., Chicago, Ill.

Other users are increasing their production and profits with this simple, fast, low-cost industrial chrome plating process.

A Large Automotive Axle Company Reports:
"Using a Chromasol plated tap with 3½ minutes plating, we are now averaging 6,800 holes per set of taps for banjo housings. This has more than doubled our former 3,000 holes per set of 7/16-14 high-speed commercial ground taps."

An Electric Motor Manufacturer Says:
"We have been able to correct manufacturing errors by Chromasol plating to salvage one hundred electric motor shafts otherwise rejected as undersize."

A Manufacturer of Plumbing Fixtures Says:
"Chromasol plating has increased the life of our 8-32 machine screw tap, used in tapping a plumbing fixture, from 1,000 pieces to 6,000 pieces."

A Pump Manufacturer Says:
"Our deliveries of small pumps for the oil industry have been speeded as much as five days by depositing .0002" to .0005" Chromasol plate on shafts that would otherwise have been scrapped or sent out to a commercial chrome plating company. This operation in one instance permitted a $16,000 pump unit to be put into operation immediately."

There's reason after reason for installing Chromaster in your plant. It can mean dollar savings to you in increased production, minimized set-up and down-time on your machine tool operation. Normal life of your cutting tools and wear parts can be multiplied three to ten times by this amazing new and simplified method of chrome plating. 3½ minutes for the average job. There's a size Chromaster for every shop.

Chromaster

Industrial Chrome Division
Ward Leonard Electric Co.
17 South Street,
Mount Vernon, N. Y.

Please send information on industrial chrome plating with Chromaster.

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CITY ..... ZONE ... STATE .....

PUMPS

FOR COOLANTS, LUBRICANTS, AND ABRASIVE LIQUIDS

PUMPS

POSITIVE DISPLACEMENT AND IMPELLER TYPES

PUMPS

J. I. C. STANDARDS OR DIRECT MOTOR CONNECTED

PUMPS

DEPENDABLE, ECONOMICAL, EFFICIENT

STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

Rollway PUMPS

Pioneer PUMP

& MANUFACTURING CO., INC.

1965 I JOHN R STREET
DETROIT 3, MICHIGAN

WRITE FOR CATALOG

asked me whether I knew anything about machining stainless steel. I said I had, in the past. He asked me to go down into the production department and look at the job. Here is what I found.

One of our engineers had designed some test flanges for use on the tire-testing machine. The material specified was 18-8; when it came in it analyzed 19% chrome and 3% nickel, which is not quite the same thing. The stuff was hard and tough; it showed a 225 Bhn.

One casting was on a 36-in. Bullard vertical mill. The boys said they couldn't machine it; the casting had been annealed, but was still plenty hard. A large variety of tools had been tried out on it at varying ranges of speed and feeds. All the tools were cracked, chipped and burned.

Now this boring mill department has a general foreman, a foreman, and an assistant foreman, known as a leader; the leader walks the floor and operates as a foreman. The foreman operates as a consulting engineer, and the general foreman—he's close to God, as I saw it. In addition to this array of executive talent there was a first-class circulating toolman, with a fair amount of higher-ups behind him, and a darn fine tool-grinding room to back them up. A metallurgist was present and available for further annealing efforts. But the job had been held up for three weeks.

I went to work. First, we threw out the water and soda cooling solution, and substituted a sulfur-base cutting oil. We took 45° tools and removed all scaled edges. I had new tools ground up so that the round nose would cut under the scale, and the side of the tool would roll the scale back. I gave those tools a 7° front clearance and a 15° top back-rake. The tools were carbide and sharp. We started with a 0.010

"I don't think you want me to use your wrench, hiding it in that tool box and putting it in the clothes locker, with the two padlocks."

ENGINEERS

TO DESIGN, REDESIGN OR DEVELOP YOUR PRODUCT

ENGINEERS

TO TOOL AND EQUIP YOUR PLANT FOR THE BEST PRODUCTION ECONOMICS

ENGINEERS

TO GET YOUR NEW PRODUCTION GOING AND KEEP IT GOING

ENGINEERS

TO REDUCE YOUR COSTS AND IMPROVE YOUR QUALITY

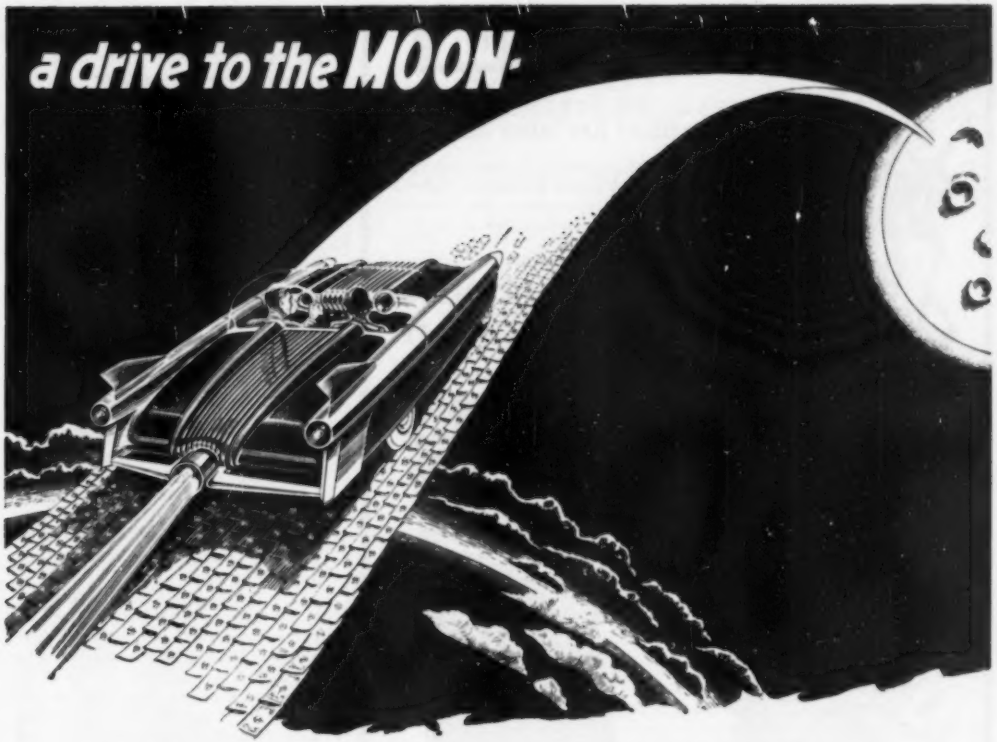
ENGINEERS, DESIGNERS, CONSULTANTS AND PRODUCTION SPECIALISTS

PIONEER ENGINEERING

& MANUFACTURING CO., INC.

1965 I JOHN R STREET
DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED



On a road paved with YOUR Dollars

A road twenty feet wide, carpeted with one dollar bills, extending 256,471 miles through space to the moon,--illustrates the astronomical magnitude of our Federal debt.

1932 was a bad year for most of us, whether we were in business, or looking for a job, or going to school.

1952 seems much better to the majority of our citizens, with increased business, high wages and a good education for the children.

But how much better off, really, are those of us who think "we're in clover"? Consider our National debt which has skyrocketed from 19 billion dollars to over 260 billion dollars in the past twenty years.

Such a figure is difficult to grasp. But it represents your debt, the amount that you and your family must pay. This debt is the obligation of every man, woman and child in the United States. The interest on this debt must be paid through taxes, and as the debt increases, the more our taxes will increase. If you have a wife and two children, your share of the Federal debt is now approximately $7,000.

Your debt is now 13 times what it was in 1932, and they're planning right now, down in Washington, to inflate it even more.

Do you like it? Is that what you want? If you don't like it and don't want further expansion of our Federal debt, it's up to you to let Washington know. Only when American citizens are aroused and speak up, by electing able and patriotic men to public office, will there be an end to this orgy of public extravagance.

YOUR SCRAP YOUNGSTOWN IS NEEDED

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
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MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment

FAMED for PRECISION

WEST POINTERS' DRILL FORMATIONS ARE MOST ACCURATE

Precision is the keyword at West Point. The Corps of Cadets is famed for the precision with which its squads, companies and battalions parade in the most complicated of drill formations and maneuvers.

OLIVER DRILL POINTERS ARE MOST ACCURATE

It has been proved in thousands of toolrooms that machine grinding is the best and most accurate method for restoring efficiency to drills. Oliver Drill Pointers give balanced cut with each lip doing equal work. The Oliver Way avoids costly production slowdowns – especially those due to excessive drill costs and imperfect holes – which can usually be traced to improper grinding of the drill points. When machine ground on Oliver Drill Pointers, drills will cut faster, last longer and produce more accurate holes.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.

No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drills!"

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

feed, and went rapidly to a 0.020 feed. I stepped the sfpm from 20 to 180. We kept a heavy stream of oil on the tool while cutting.

I noticed that the operator had a habit of feeding his tool in by hand to make contact, and then taking a preliminary cut before turning on the coolant. In taking this initial cut, the tool sent up a pungent cloud of white smoke. What he was doing, without realizing it, was destroying the edge of the tool before turning on the power feed. I stopped that practice in a hurry.

At one stage of machining, the flange developed several severe ridges on the surface. These ridges were due to hard spots in the casting and would not machine out. I turned off the coolant oil, dried the casting with a cloth, dried the tool, and let the dry tool run back over the surface a few times without any addition to the feed. The ridges machined out perfectly. I stayed with that job every minute of the time and the castings are coming off beautifully machined.

Theoretically, there is enough talent around that Bullard to machine any sort of job put on it. The machine is a honey, the operator was willing, and all sorts of technical help was available, but yet the job didn't go. I had to step out of my own department and stay with the job every minute to make it go.

And that, I think, was the trouble. Other men could have done the same thing I did, but for some reason they didn't. The job required someone to stay right there, continually advising and counseling the operator, and helping him solve every contingency as it came up.

Every shop had need for a man who would do what I did. If Ed will pick a man and use him to start

"You can't smoke in there — that's gun powder!"

How's this

for putting brains to work?

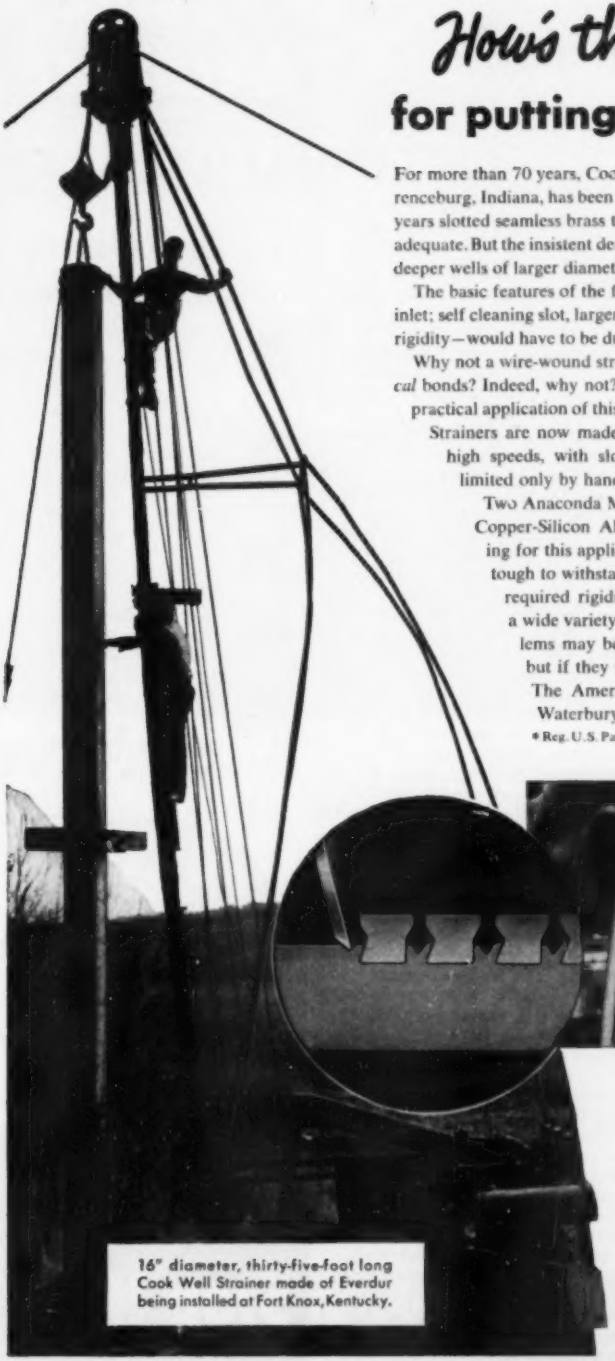
For more than 70 years, Cook Well Strainer Company, Inc., of Lawrenceburg, Indiana, has been making well strainers. For many of these years slotted seamless brass tubes, up to 12" diameter, proved wholly adequate. But the insistent demand for more and more water called for deeper wells of larger diameter—and strainers to meet the new needs.

The basic features of the famously successful tube strainer—direct inlet; self cleaning slot, larger inside than outside; one metal; strength; rigidity—would have to be duplicated in larger diameters.

Why not a wire-wound strainer with automatically-made *mechanical* bonds? Indeed, why not? The illustrations on this page show the practical application of this ingenious idea. Cook Wire-Wound Well Strainers are now made in sizes up to 40" inside diameter—at high speeds, with slot widths readily variable, and lengths limited only by handling facilities.

Two Anaconda Metals, Red Brass-24 and Everdur*-1010 Copper-Silicon Alloy, have proved themselves outstanding for this application. Both machine readily, are plenty tough to withstand upsetting, contribute strength for the required rigidity, and provide excellent resistance to a wide variety of corrosive ground waters. Your problems may be different, mechanically or chemically, but if they involve copper, brass or bronze, call on The American Brass Company, General Offices, Waterbury 20, Connecticut.

* Reg. U.S. Pat. Off.



16" diameter, thirty-five-foot long Cook Well Strainer made of Everdur being installed at Fort Knox, Kentucky.

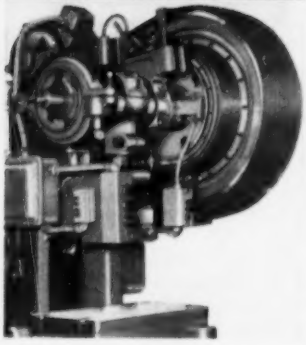
As the supporting skeleton of bars revolves in this winding machine, each bar is machine-notched ahead of the spirally wound wire (see circle illustration). This wire is a special drawn Anaconda Shape of modified keystone cross-section. A circular form tool then displaces the metal on one side of the V-groove into the dovetail section of the wire, locking it securely.

the name to remember

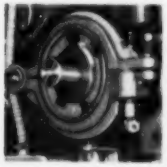
ANACONDA

COPPER, BRASS & BRONZE

MORE
Speed – Safety
Production
with
L & J - FAWICK
AIR CLUTCHES



Here's the answer to more production — L & J Presses equipped with L&J-Fawick Air Clutches and variable speed drives. This unbeatable combination gives you maximum speed for each operation — often 2-1/2 to 3 times normal production, greater safety through rapid, shock-free, full-power operation. Let us show you how these L & J Presses can increase your output of high-speed press work and cut down operating cost.



NEW
AIR RELEASE SPRING-SET BRAKE

Another important L&J safety feature. Brake automatically applied if air pressure fails — positive, foolproof.

L&J Presses are made in 12 O. B. I. models—back geared and plain flywheel types—8 sizes from 6 to 80 ton capacities. *Write for literature.*

L&J PRESS CORPORATION
1629 STERLING AVENUE
ELKHART, INDIANA

and keep the jobs going, I think it's a swell idea. If he picks a man who becomes a carbon copy of himself, and stops only long enough to advise and then pass on, why then I'm quite sure the idea will not work. It will be just a case of one more bit of overhead to make the management unhappy.

If he finds a man who will work, he's got something. If the man won't work, it's a dud.

James K. Matter
Detroit, Mich.

•

MAYBE TWO HEADS are better than one and sometimes two skills should work out.

I have trained thousands of workers and have always found that when competition can be utilized, the results were always profitable to all concerned.

One thing I have noticed is that the learning process was more exciting when the competition was keenest. Often old students stop to thank me for what they thought was a strenuous drive to fit them to meet competition. Many of them are top-notch men and they have not forgotten the early lessons learned.

On one occasion during World War II, we had 36 students, 13 machine tools and 4 work benches, when three government inspectors found two and sometimes three students operating one machine. They started to raise the roof because they thought that we were using wrong training methods. I said that if they would take the trouble to visit among the new students, they would see more than I could tell them.

There were three men just starting to set up a 36 in. fly wheel in a lathe. All the students were starting their first shift. They began by electing a leader to start and then take turns. The leader required 100 minutes to chuck up true and take light cut. The second required 80 minutes and the third required 50 minutes. Then on the second round the leader finished in 40 minutes and the second man did it in 30 minutes and the third cut the time to about 20 minutes. The inspectors were watching closely, they were sold on the plan and they said they would recommend that other schools try it out.

In this case each student could see the mistakes the other had made, and his thinking cap was working overtime to get ahead of the others.

We had a rule that the student making the most progress in each shift was made an assistant instructor

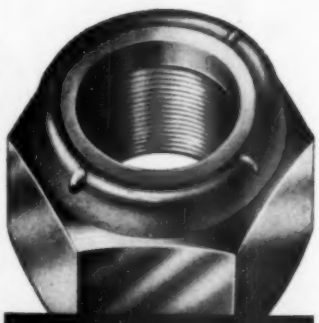
. . or Released in an Instant

Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

Write
GREER STOP NUT CO.
2620 Flournoy, Chicago 12, Ill.



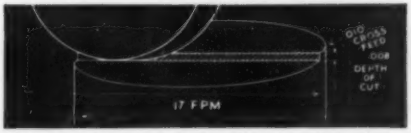
GREER Stop Nuts

BUY PRODUCTION TIME WITH ROBERTSON COOL-CUT WHEELS

Typical of the time-saving, precision performance of Robertson Cool-Cut Grinding Wheels are the operations illustrated. Cool-Cut Wheels—with their open structure—provide maximum chip clearance, reduce heat generation. They remove stock faster and with less effort than conventional wheels.

Compare the performance of these wheels with those you are now using and you'll understand why we say that with Robertson Cool-Cut Wheels, *you buy production time.* For surface grinding, internal grinding, tool grinding, or operations of any special nature whatsoever, we'll be glad to recommend the proper Robertson Wheel to do the job better. Send for your free copy of the booklet "How to Buy Production Time." It's full of information on how to increase production in your grinding department.

In surface grinding a piece of hardened steel, Rockwell 62, a Robertson Cool-Cut Wheel was used for stock removal. It easily took .010" depth of cut, with a .015" cross-feed, table travel 17 feet per minute, in one pass across a 2" x 4" piece of steel. There was no measurable wheel loss, and the metal remained cool.



A plant was trying to surface grind a 6" round die of Carpenter KW, 1½" thick. Eight hours had been spent testing various wheels and machines and it looked as if the die could not be ground. Then a Robertson sales engineer was called in. Using a Robertson Cool-Cut Wheel, he took off .008" in one pass with .010" cross-feed, generating a minimum of heat.

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

New XL BOND
FOR CARBIDE TOOL AND CUTTER
Grinding

EFFICIENT ECONOMICAL
ROUGH GRINDING AND FINISH GRINDING
NEAREST THING WE KNOW TO A DIAMOND WHEEL
FOR PRECISION AND OFFHAND GRINDING

Another Chicago Wheel FIRST

"XL" is Chicago Wheel's exclusive new bond for silicon carbide vitrified grinding wheels, especially made for grinding carbide cutting tools. Supplied in most popular sizes and steel backs. Prompt delivery. Keep your production up . . . costs down, with "XL."

AVAILABLE NOW FOR PROMPT DELIVERY

Offices in principal industrial centers
Write for Free Information

CHICAGO WHEEL & Mfg. Co.
Dept. AM, 1101 W. Monroe St., Chicago 7

on the next shift. They were always on their toes and boning up so as to get as many instructor shifts as possible. Of this enrollment of about 620 students, more than 50 were holding foreman and instructor positions in less than a year.

In school-training we also used mathematics and it is my opinion that was the greatest spur to advancement that we had. We had several students with college degrees from large colleges and their greatest handicap was that they lacked experience and, often, mathematics. Here are a couple of questions that all students were asked:

If eggs were worth one cent each, how many dozen could they buy for a half dollar?

If three men were standing in line and one stepped one foot, another stepped two feet and the third stepped three feet, how far would they have to walk before they stepped in line again?

When they graduated at the end of 13 weeks, they could answer offhand questions relating to dividing heads, gear trains, gear pitch and thread cutting and angles and were proud of it as they could do very complex problems by mental concentration, or old-fashioned mental arithmetic. No student dared to use pencil and paper because the other students would give the answer before he could put it on paper.

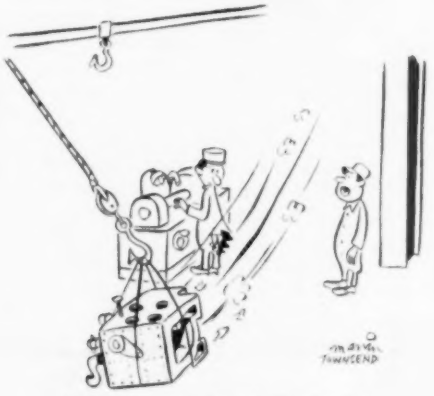
Clark Gilbert
Bridgeport, Ohio

•

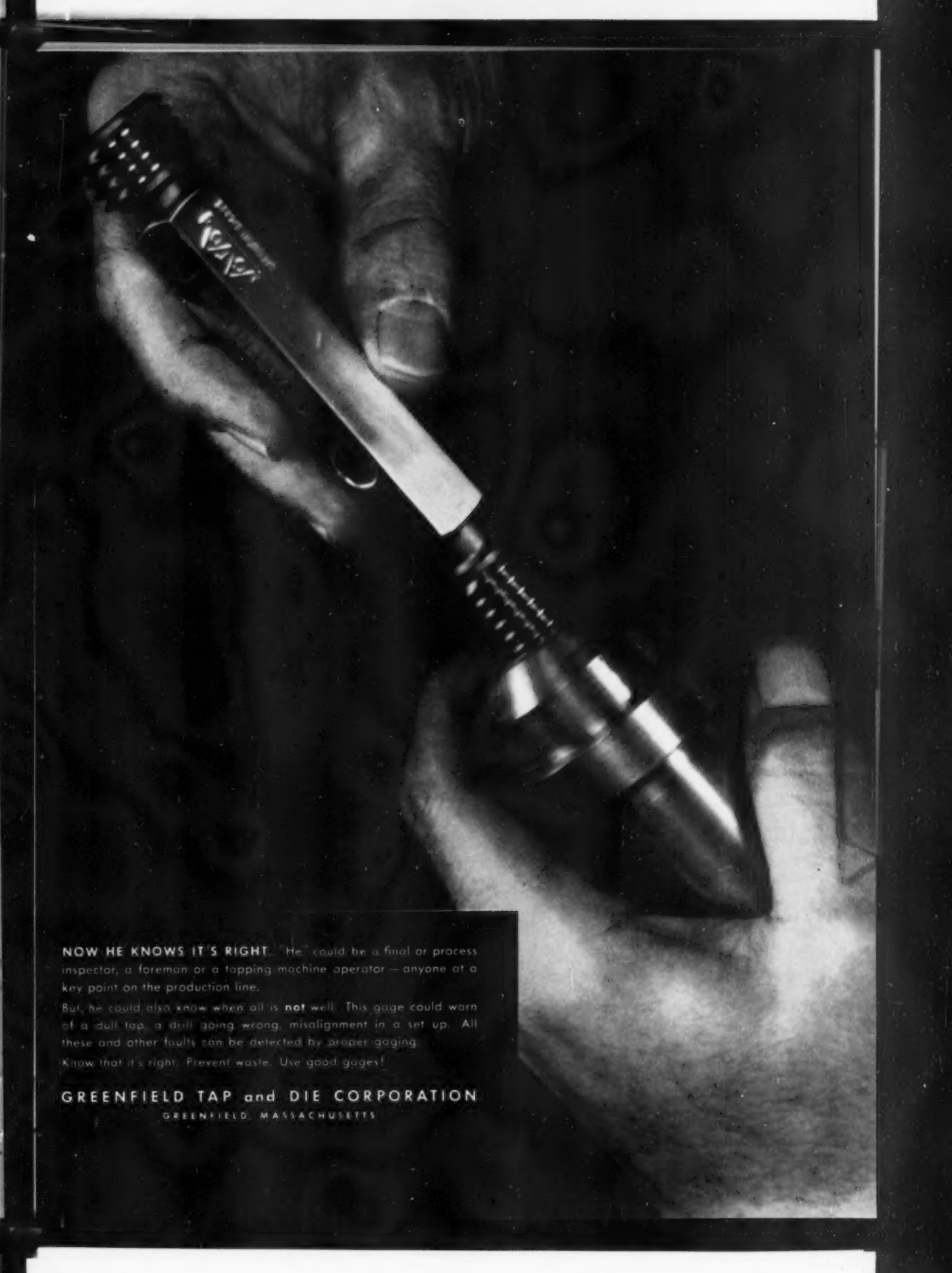
THE IMPROVEMENT of shop methods is perhaps one of the most important functions today in our ever-increasing cycle of higher production costs. It is unfortunate that many companies have not yet realized the value of methods instruction. Too many companies are not yet aware of the fact that by a slight change in manufacturing methods or tooling many thousands of dollars can be saved. The cost of many method improvements is practically nil when compared to the reduction in cost of production.

Reductions in production cost can do two things. First, it is possible for a company to reduce the selling price or at least hold the line on prices, which means increased sales and higher production. This leads to a second point, i.e., increased production allows the company to keep its employees busy and also usually increases the number of employed personnel. The employees gain because they are steadily employed and through improved methods have better working conditions. This frequently leads to increased wages which are paid from reduced manufacturing costs.

So we see that methods do pay off. Now how should methods be handled? Should it be the function of the foreman or should a special department be established? Let us consider the foreman type of methods work since it is closely allied with the discussion between Al and Ed. It would appear that in the company in which these men are foreman little or no organized methods had ever been established. Thus the field is very fertile for improvement. In fact it has apparently become so noticeable that the workers themselves felt that improvements could be made. This condition could be due to either Ed's lack of ability as a foreman or to the company's lack of proper training of the foreman along the lines of thinking about improved methods.



"Mighty close call, Gus, and I'll bet you're not even wearing your safety shoes."



NOW HE KNOWS IT'S RIGHT. "He" could be a final or process inspector, a foreman or a tapping machine operator — anyone at a key point on the production line.

But, he could also know when all is **not** well. This gage could warn of a dull tap, a drill going wrong, misalignment in a set up. All these and other faults can be detected by proper gaging.

Know that it's right. Prevent waste. Use good gages!

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS

GEO MET RIC

KD and CK

Bulletin KD 4 pages

rotary self-opening die head

for use on live spindle machines

Style KD

The KD Rotary Self-Opening Die Head has been expressly designed for use on any live spindle machine, particularly on automatics. Long service and threads cut to precise accuracy are insured by the KD's features of rugged simplicity, compactness, positive tripping, and positive resetting. Chaser removal is easy. Right or left hand threads can be cut with equal ease. The KD tools are made in seven sizes providing a cutting range of ⅛" to 2½". The hollow shank permits handling any length permitted by the machine construction.

SPECIFICATIONS STYLE

Style and Size Inches	CAPACITY				Code Word	A	B	C	D	E	F	K	†Standard Shanks			Maximum Shank Without Bushing	
	Straight Threads			Standard Pipe Threads								Yoke Thickness	Dia.	Lgth.	Bore	Dia.	Lgth.
	Diam. Inches	Length	Coarse or Pitch														
KD ⅝	⅛– ⅝	1 ½	18	None	Radix	2⅛	1 1⁵⁄₁₆	1 ½	½	⅝	⅞	⅞	½	⅝	1 ⅛	1 ½	⅝	2⅝
KD ⅞	⅛– ⅞	2	12	⅛– ¼	Racema	2 ⅜	2 ⅛	1 ⁴³⁄₆₄	½	¼	1 ⅛	1	⅝	½	1	2 ¼	⅝	1	3⅛
KD 1	⅛–1	2 ½	8	⅛– ⅜	Bally	3 ⅛	3 ⅝	2 ½	⅝	½	1 ⅛	1	⅝	½	1 ½	2 ¼	⅝	1 ½	4⅛
KD 1 ⅛	⅛–1 ⅛	3 ⅛	7	¼– ½	Raphia	4 ⅜	4 ⅛	2 ⅝	⅝	½	1 ⅛	1	⅝	½	1 ½	2 ¼	1	1 ½	4⅛
KD 1 ½	⅛–1 ½	3 ⅛	6	⅜–1	Ranown	5 ⅛	4 ⅛	3 ⅛	⅝	½	1 ⅛	1	⅝	½	1 ½	2 ¼	1	1 ½	4⅛
KD 1 ½	⅛–1 ½	3 ⅛	6	⅜–1 ½	Repand	5 ⅛	4 ⅛	3 ⅛	⅝	½	1 ⅛	1	⅝	½	1 ½	2 ¼	1	1 ½	4⅛
KD 2	1 –2	3 ⅛	6	1 –2	Reside	6 ⅛	4 ⅛	4 ⅛	¼	½	1 ⅛	1	⅝	½	1 ½	2 ¼	1	1 ½	4⅛
KD 2 ½	1 ½–2 ½	3 ⅛	6																

*Length that can be cut when Shank is solid.
†The following KD Die Heads are also considered Standard.
⅛", ¼" and ⅜" KD for Davenport Automatic.
⅜" KD for ⅜", ¼" or ⅛" Gridley M. S. A. (Standard Spindle).
⅜" KD for ⅜" Gridley M. S. A. (Sensitive Spindle).
1" KD for 1¼" Gridley M. S. A.
1¼" KD for 1¾" Gridley M. S. A.
1½" KD for 2¼" or 2½" Gridley M. S. A.

SPECIFICATIONS STYLE CK DIE HEADS

CK 1	⅛–1	2 ⅛	12	None	Cekab	3 ⅛	2 ⅛	2 ⅛	½	¼	1	1 ⅛	2 ⅜	1 ½	½	⅝	1 ¼	2 ¼	1 ⅜	1 ¼	4⅛
CK 1 ⅛	⅛–1 ⅛	2 ⅛	12	None	Cekad	4 ⅜	3	3 ⅛	½	¼	1	1 ⅛	4 ¼	2 ½	½	⅜	2 ¼	2 ⅜	1 ⅜	2 ¼	4⅛
CK 2 ⅛	1 ½–2 ⅛	2 ⅛	12	None	Cekaf	5 ⅛	3 ⅛	3 ⅛	½	¼	1	2 ⅛	4 ¼	2 ⅜	½	⅜	2 ¼	3 ⅛	2 ⅜	2 ⅜	4⅛
CK 2 ⅛	2 –2 ⅛	2 ⅛	12	None	Cekal	5 ⅛	3 ⅛	4 ⅛	⅝	¼	1	2 ⅛	5 ¼	3 ⅛	½	½	3 ⅛	4	2 ⅜	3 ⅛	4⅛
CK 3 ⅛	2 ⅛–3 ⅛	2 ⅛	12	None	Cekam	6 ⅛	3 ⅛	4 ⅛	⅝	½	1 ⅛	3 ⅛	5 ⅛	3 ⅜	½	½	3 ⅛	4 ½	3 ⅜	3 ⅛	4⅛

Chasers do not interchange with KD and KM2. *Length that can be cut when Shank is solid. Standard K Chasers used in KD Die Heads.

GEOMETRIC TOOL COMPANY DIVISION
Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT

Ed, it would appear, has knowledge of what should be done but has never had the time to get going on a program. This may be the result, perhaps, of his not knowing just how to proceed, plus the paperwork which he frequently brings up as a reason why he does not get things accomplished. Such conditions exist in many plants. It is not because the foremen do not do their jobs, but because they lack the proper tools to get the program started.

In this case Ed has been given a chance to start a program. It may backfire, but if Ed is a good foreman and in being a capable foreman, a good judge of men, he will prevent the pitfall that Al talks about. There are certain people who get swelled heads, but Ed will not choose that type of man because he can quickly spot them in his organization. The fact that the foreman controls the methods within an organization is not a vital point. The thing that is important is that methods work is being carried on.

Here is a start where the company and this department are going to make progress. As the work of improvement progresses it will become less and less effective since in any work where new blood or ideas are not drawn into the plant, stagnation starts to set in. Foreman method control in this respect is no worse than tightly controlled methods departments which do not answer to the foreman. In either case care must be taken to see that continued new thinking is introduced.

The foreman is as capable of directing the method program as the superintendent or the vice-president. However, perhaps the foreman is a little more reluctant to add new thinking which does reflect upon the continued program's effectiveness.

A methods man should not be placed on a "save his own salary" basis. Too frequently methods are combined with the new production of products which could result in losses at the start. Product develop-

"Well, if a magazine can be dog-eared . . . why can't a dog be magazine-eared?"

IT'S THE *INTERNAL SMOOTHNESS* THAT COUNTS

FULMER HONING MACHINES

for fast precision finishing of internal cylinders

STOCK IS REMOVED by abrasive stones under controlled pressure in a rotary and reciprocating motion—simultaneously. This produces a round, straight bore to the finest degree of accuracy. Photo was taken doing just this in a large steel mill.

Internal cylinders from ½" to 30" diameter are finished to tolerances as close as .0001 (±). For ferrous or non-ferrous metals, plastic or glass.

THE CHIPS TELL THE STORY

A multitude of chips UP TO SIX INCHES LONG is shown here cut away from a steel hydraulic cylinder.

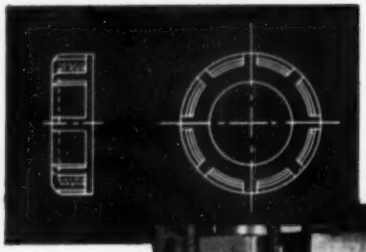
WRITE TODAY for your copy: "WHAT TO KNOW ABOUT HONING"

C. ALLEN FULMER CO.

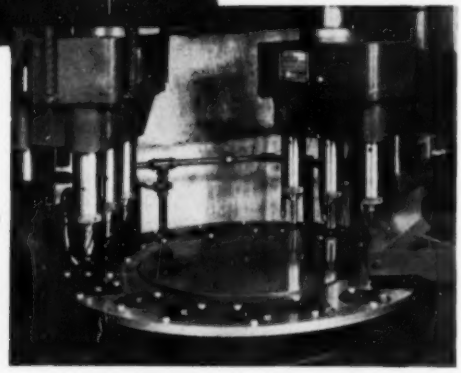
105 EAST FOURTH ST. CINCINNATI 2, OHIO

CLEVELAND tapping machines *lead screw*

2919 Pieces per Hour!



CLEVELAND Special Combination Drilling and Tapping Machine equipped with a drilling unit and a Model E-2 CLEVELAND Lead Screw Controlled Tapping Machine mounted over an automatic six-station index table. (Below)



Here is an unbeatable combination for a manufacturer who must save valuable working time and cut production costs... a CLEVELAND combination drilling and tapping machine with three spindle multiple heads on each unit for core drilling or reaming and tapping three parts at one time. This particular CLEVELAND machine turns out 2919 ½" bushings per hour at 100% efficiency. Your own tapping problem may not involve the production of bushings but CLEVELAND engineers have the know-how and engineering experience to design and build for your plant tapping machines which will cut costs and increase production. They invite your inquiries without obligation on your part. Write today for your copy of Cleveland Catalog *AM-16*.

Mr. Lead Screw says:

...Check with Cleveland First if you need to perform any of these operations: Core Drilling... Reaming... Tapping... Threading... Chamfering. Cleveland engineers can show you how to effect economies in these operations. *Cleveland Tappers have ALL the features you want.*

When you write for your catalog ask us to include a copy of the CLEVELAND PRODUCTION TAPPING GUIDE. Full of valuable data for engineers and operators.

THE CLEVELAND TAPPING MACHINE CO.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.
CANTON 6, OHIO

ment and methods are closely allied and when methods men are just placed on "save your wages or else" basis the plan usually fails. The ability to sell the new methods to his superior and to his fellow-worker is part of the methods man's job. He must have the ability or he cannot be classed as a good employee for this type of work.

The foreman will make mistakes in picking men from his rank and file for this position, but if the company does not take active interest in an over-all plan, we say, "More power to the foreman for wanting to be progressive." He will grow and develop as he works with this new program. In fact, if the foreman really makes a success of cost reduction method of improvement and saves the company money, he places himself in line for advancement.

Methods do pay off. More foremen should think about their methods and act.

Charles D. Townsend
West Hartford, Conn.

•

THERE IS A GREAT deal to be said for the idea of a shop methods man, and from my own experience I know it works to the advantage of a busy foreman. Such a man, if chosen carefully, can be a distinct asset.

First, he must be a seasoned mechanic, familiar with all the tools in the shop and able to impart his knowledge to others in such a way that the men will feel free to approach him. In other words, he must be the type of individual who can get along with the men and not develop a superiority complex, or as the boys would put it, a big head.

Then there is the matter of loyalty —the type of loyalty where the methods man knows enough not to deal with matters that are the particular province of the foreman.

Given a man who qualifies on these counts you can be assured that a great deal of the load will be lifted from your shoulders, leaving you free to concentrate on the other shop problems that have a tendency to pile up while you've been away straightening out Bill So-and-so on the turret lathe.

Which brings us back to the first principles of foremanship, one of which is the ability to delegate responsibility to others, so that we may have a firmer executive grasp on the reins of production. The days when a foreman was a glorified setup man and troubleshooter are far removed from us and likely to stay that way, all because some "lazy" individuals got tired of being bogged

"Tycol Afton keeps cutting edges cool... lengthens tool life between grinds"

Right! Tycol Afton Cutting Oil steps up tool performance . . . allows closer tolerances and finer finishes.

It makes fast, free cuts possible—reduces spoilage and the need for frequent regrinding.

Tycol Afton is a "dual purpose" oil, used for both cutting *AND* machine lubrication. Several grades are available for use on any specific machine tool.

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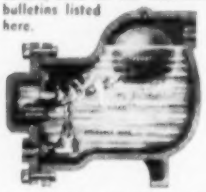
Send for Nicholson Bulletins on These

3 WAYS TO SAVE TIME

in Production and Maintenance

On the basis of their time-saving records, leading shops are increasingly standardizing on these 3 Nicholson units. For details, send for the individual bulletins listed here.



NICHOLSON AIR TRAPS—For intercoolers, aftercoolers, receivers, tanks, etc. Feature non-plug and non-wire-drawing valve. Instantaneous operation and extra large drainage capacity effect fast, positive action. Catalog 751.

NICHOLSON CONTROL VALVES — Specially treated hard seats, wide choice of metals for specific mediums, and easy repacking cut maintenance time. Non-corrosive flat discs lap themselves on seats. Many leading plants have adopted Nicholson valves because of their longer leak-free service. 2-, 3-, 4-way and special types. All manner of operation. Size ¼" to 2½"; press. to 5000 lbs. Catalog 552

NICHOLSON EXPANDING MANDRELS—Set of 14 does work of 209 solid arbors; sensational time savers in some operations. Sold singly or in sets; for bores ½" to 7". The standard in shops the nation over. Bulletin 750

114 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

Fewer Parts make Easy Assembly

Simple construction, fewer parts make assembly and disassembly easy — also mean longer life.

CURTIS UNIVERSAL JOINTS

Simple construction is not the whole story. A combination of modern design, wise choice of alloy steels, with a special heat treatment for each part, give greater strength with less weight. And you can depend on Curtis catalog ratings — they are based on hundreds of actual tests.

ONLY CURTIS OFFERS ALL THESE ADVANTAGES

Availability — 14 sizes always in stock.

Simplicity — fewer parts, simpler construction.

Government Tests — complete equipment for government tests in our plant.

the only Universal Joint with the "Telltale" Lock Ring (patented)

Write today for free engineering data and price list

CURTIS UNIVERSAL JOINT CO., INC.

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As near to you as your telephone

A MANUFACTURER OF UNIVERSAL JOINTS SINCE 1919

down by detail and decided to use the hidden talent around them.

R. S. Alexander
Greenville, R. I.

•

YOU WOULDN'T THINK that a fellow like Le Blanc would have his eyes open as to how the foreman could be more efficient, would you? Oh yes, there are many Le Blancs around. You'd be surprised how many guys there are who have their minds upon their boss to see how he functions. While their interest is in no way selfish—they wouldn't take on a job as foreman if you were to provide them with a golden chariot to ride around the shop in—they have an innate something-or-other that detects a weak spot.

One of my fellow-workers confided to me some years back: "Look at Harris; he's going around like a chicken with his head off. Why doesn't he assign some of the unnecessary details to a dependable guy so that he doesn't have to make a nervous wreck out of himself?"

There is no doubt about it but a foreman has his hands full in handling his job effectively. Anything to ease his load, or to shift a portion of it to another's shoulders so that he could concentrate his efforts on more important things would be of considerable benefit. But, Mr. Foreman, use every care in picking out your veep. A foreman should use the same precaution as a voter should in electing a man to take over in the event of something happening to the chief.

One thing the foreman must be sure of when selecting an assistant is that the person is honest and loyal. If he has these two attributes he can't go wrong. He has been given the job of assistant to relieve the boss of certain technicalities and

"HEEL-ical . . . HELL-ical . . . stop correcting my pronunciation and go get those gears."

UTICA'S NEW RIB-JOINT®

Pliers # 507-10

With *FORGED* rib-joint for added strength exactly where you need it.

PAT. APP. FOR
FULL FORGED RIBS
CAN TAKE IT!
AND HERE'S WHY:
CROSS SECTION VIEW OF FORGED RIBS
SHOWING STEEL FIBRE STRUCTURE
STRONG BECAUSE STEEL FIBRE STRUCTURE IS COMPRESSED AND FORCED TO FOLLOW CONTOUR OF RIBS
EACH RIB SHARES THE SINEW-LIKE STRENGTH OF THE ENTIRE JOINT MEMBER

Full forging of the rib joint is the secret of this new UTICA pliers. Forging makes the steel fibre structure follow the contours of the ribs as shown in the diagram above. Hence, each rib shares the sinew-like strength of the entire joint. There is no weak point, likely to break, with this method of manufacture.

Be sure you see these new pliers! One look, one "heft", and you'll know that they live up to the standard of UTICA quality.

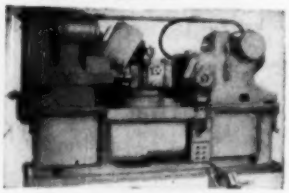
It pays to use quality tools — U TI CA® — and the world's best tools are made in U.S.A.

DROP FORGE AND TOOL CORPORATION

UTICA 4, NEW YORK

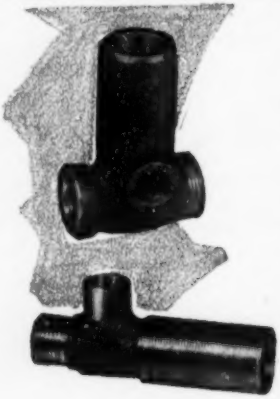
In Canada: ADLAM TOOL & SUPPLY CO., LTD., MONTREAL; WALLS-IRONS, LTD., WINNIPEG

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore it means *more* finished pieces in a given period of time and greater accuracy in every finished piece.



The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DeLEEUW

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

not placed there to feather his own nest.

One of the greatest mistakes a man can make is to take another on to help out in bearing his load and letting down the bars of shop relations. I don't mean by this that the foreman should be a snob; I mean that he should continue to conduct himself as the foreman. A wrongly selected shop veep can be a source of considerable annoyance to any conscientious foreman.

A shop veep should be selected with the understanding that he has not a permanent berth. Emphasize with an injunction that he has certain duties to perform and that he should not exceed those duties. Also let him know that any attempt to climb the ladder of success by using another's neck for a convenient rung will result in a button-stripping court-martial.

J. Homewood
Ontario, Calif.

•

LAST OF THE MECHANICS

Is there such a thing as a "typical workman?" Should a shop worker, mechanic, or toolmaker dress down or up to his profession?

BACK IN THE OLD DAYS the average machine shop was one of the dirtiest places on earth.

We had dirt floors, poor lighting because the windows were never clean, poor sanitary facilities, and other things equally bad.

In fact, the whole setup was so bad that one firm desiring to improve conditions decided to either move to another building or build a new shop.

The latter course was chosen, and after the new building was completed the crowd moved in. This was an example of such progress and improvement that many came to stare and wonder at the so-called extravagant layout and foolish spending.

In this old shop there were usually about a dozen apprentices and up to the time they moved they had been as dirty as the shop.

Like Mullins, there was an old general foreman who wore his white shirt while he was working. He never wore overalls, shined his shoes, and it seemed as if he were dressed up all the time.

This man could do any operation in the shop when he was required to, and nobody seemed to think that his regalia was out of place for all were accustomed to his appearance.

After this recital of his good quali-

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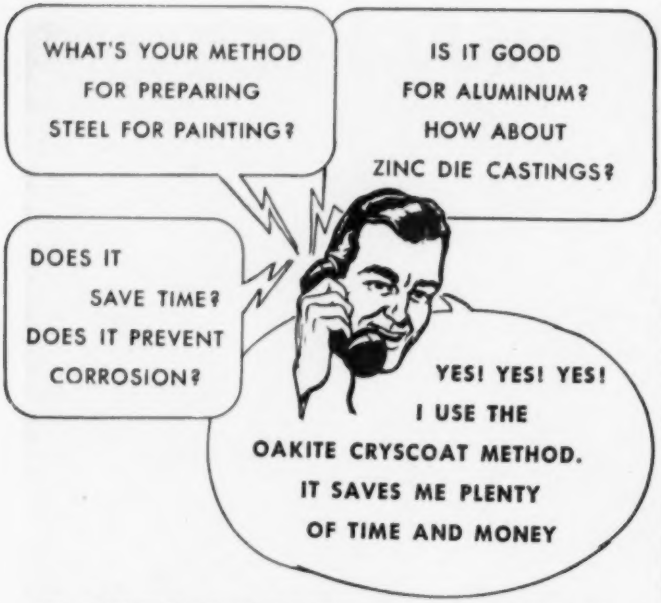
WHAT'S YOUR METHOD FOR PREPARING STEEL FOR PAINTING?
IS IT GOOD FOR ALUMINUM? HOW ABOUT ZINC DIE CASTINGS?
DOES IT SAVE TIME? DOES IT PREVENT CORROSION?
YES! YES! YES! I USE THE OAKITE CRYSCOAT METHOD. IT SAVES ME PLENTY OF TIME AND MONEY

The OAKITE CrysCoat* PROCESS does three things at one time:

1 Cleans metal rapidly—removing cutting, drawing, stamping oils and compounds, rust preventives, fluxes, smuts and other soils.

2 Conditions metal for painting—preparing steel, aluminum, zinc die castings and other metals for lasting adhesion of paints, lacquers and enamels.

3 Increases resistance to corrosion—preventing it before painting; localizing it after painting.

Eliminating the need for separate cleaning and phosphating operations, the OAKITE CrysCoat PROCESS cuts costs these ways:

- Uses less equipment
- Cuts operating time
- Reduces heating costs
- Saves cost of acid-proof equipment
- Reduces scaling and sludging
- Saves paint
- Reduces rejects

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*Reg. U. S. Pat. Off.

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MATERIALS • METHODS • SERVICE

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ties, let's look at the other side of his nature. He was the meanest man who ever had a hand at instructing an apprentice, but he could teach any dumbhead who could understand English, and teach him well.

As soon as the gang began working in the new place, he called the apprentices together and said something like this:

"Now, you boys have looked like a lot of hogs in the old shop. You notice on Monday mornings I come to work wearing a clean white shirt, clean pants, shoes shined and my hair combed nice and neat; on Thursday I come with another lot of fresh, clean clothes on. Next Monday, I want you boys to have clean overalls on, and then keep yourselves clean all the time. No shirking on this or I'll lick hell outa all of you."

The boys would stand at arm's length when working at a bench or machine in order to remain neat and most of them succeeded fairly well. When a real dirty job came along, they would put on aprons for the time being, then clean up when it was finished.

Please remember that all of this took place when an apprentice was paid the munificent sum of five cents per hour.

Here was one of the earliest wage incentives, for, when a boy had kept himself clean all week and quitting time came on Saturdays, each one was awarded a dime for his great effort in keeping himself tidy.

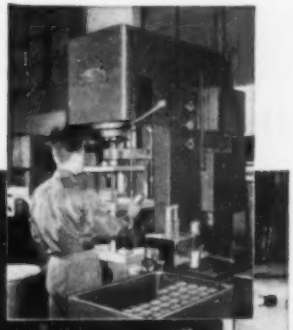
When an accident or incident caused a boy to backslide, he would go to George and explain his trouble. George looked him over and also looked over the place where the disagreeable event took place and decided whether the boy should have his bonus of ten cents or be blacklisted that week.

This small inducement caused the boys to keep their machines clean and they personally cleaned the

"I rigged it up so my suggestion will get special attention."

MULTIPRESS®

solves another "tough one"



Feeds and Forms hard-to-handle plastic with automatic accuracy

U. S. Gasket Co. gets quality plus speed in compacting parts from Du Pont's Teflon

Toughness and high heat-resistance make Du Pont's Teflon an ideal plastic for many needs. But feeding the raw material to molding dies has been a problem; the granules tend to cling together in a non-fluid mass.

MULTIPRESS solved the feeding problem with its unique, shuttle-type, self-agitating feed attachment. In addition, the smooth, oil-hydraulic operation and fully adjustable ram action of Multipress brought other production gains. At cost-cutting production speeds, compacting is done with *automatically uniform results*—a necessity because most Teflon parts made at U. S. Gasket must pass micrometer tests for close-tolerance requirements.

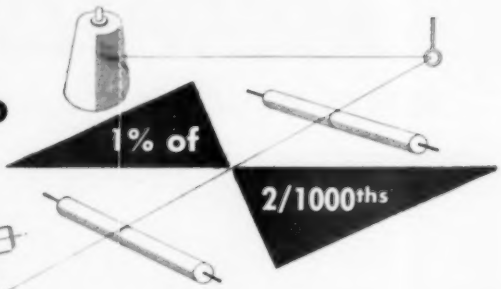
Quick tool-changing and easy adjustment of ram stroke, speed and pressure are further advantages. With more than a thousand different dies, U. S. Gasket switches four Multipresses from one group of short-run jobs to another with minimum loss of production time.

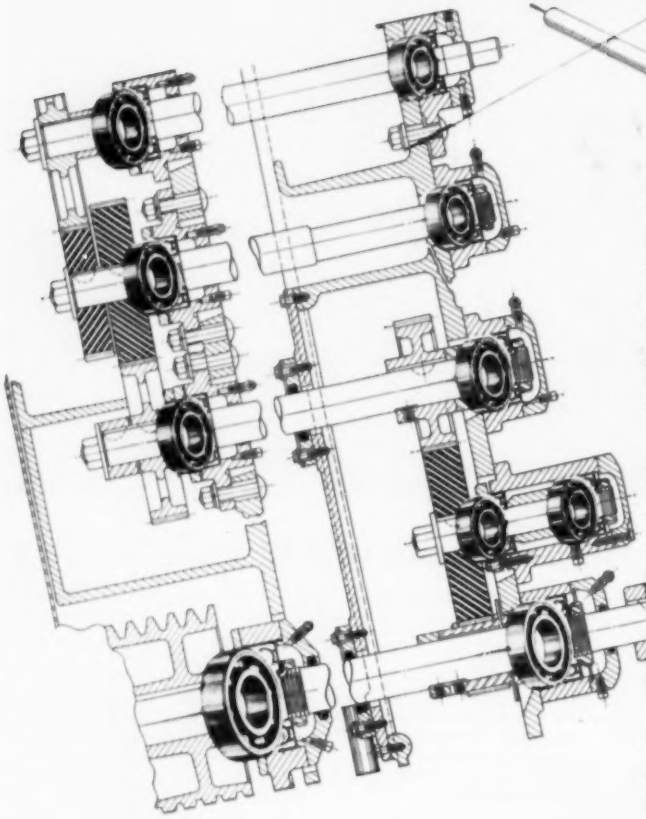
Another feature this manufacturer likes is that Multipress provides a bottom ram to apply pressures upward giving equal pressures on top *and* bottom of parts. The four automatic Multipresses now in use at U. S. Gasket—a 25-ton, a 15-ton and two 8-ton units—are all equipped for this "double-end" ram action.

Multipress is getting better results for hundreds of manufacturers, in many different fields, because it provides smooth, rapid, low-impact pressures under accurate control—easily adjustable to the exact need. Eight frame sizes available . . . one-ton to 50-ton capacities . . . auxiliary equipment for many special needs. Write for full details.

THE **DENISON** DENISON Hydr OILics
ENGINEERING COMPANY
1164 Dublin Rd. Columbus 16, Ohio

SETUP
that holds tolerance to





If you are familiar with machine designing, you'll consider this a "neat" piece of engineering. Such precision is actually achieved on mammoth synthetic thread twisters developed by Whitin Machine Works. The twisters stretch thread to a uniform .002 of an inch diameter and hold that diameter to within a 1% tolerance down a 40 foot line of spindles.

A sectional view of the head end which controls the "feed rolls" and "draw rolls" shows the Fafnir Ball Bearing setup that helps to keep their relative velocity absolutely constant . . . a "must" to produce such an amazing degree of accuracy. The Extra-Precision ball bearings used are made by highly trained operators on special equipment controlled by elaborate inspection devices.

Whatever your bearing problem, a few minutes spent with a Fafnir representative may help you solve it equally as successfully. Fafnir's experience is not limited to just a few industries . . . it's industry-wide. The Fafnir Bearing Company, New Britain, Conn.

Bearings used
Fafnir Extra-Precision Ball Bearings of the 200 (Light) and 300 (Medium) Series are shown in the ten locations above.

Standard Radial Ball Bearings

Power Transmission Units . . . all types and sizes

Wide Inner Ring Ball Bearings with Mechani-Seals

FAFNIR
BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

floor in their neighborhoods. This attitude of cleanliness permeated the whole organization and men, machines and building were greatly improved in appearance.

There are many plants where cleanliness is one of the paramount requirements and they are usually the progressive ones.

F. H. Stebbins
Worcester, N. Y.

•

MULLINS STANDS out as a symbol of distinction for the real toolmaker of today. He is symbolic of craftsmanship of the highest degree in interchangeable manufacturing. Without him we would revert to expensive cut-and-try procedure, wherein no two pieces would be identical in size and shape. Prohibitive costs would prevail and down would go the purchasing potential.

Why shouldn't the master craftsman be dressed in dignified fashion? There is a psychological twist in connection with a man's working attire. A man is as efficient as he feels. While he may look out of place to some in a gentlemanly get-up, he is in reality on the job feeling in the best of spirits and as a consequence can produce much better than were he slovenly attired.

A toolmaker prides himself on the work he does. New problems are constantly popping up for his solution. The work is always new to him; no monotonous repetition bores him throughout the day. He does things right: not a shade under or a shade over, but down to the infinitesimal minuteness of measurement. It is a great satisfaction to him to know that his work compels

"That counter counts to ten—then it reads Jack, Queen, King."

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Your PROBLEMS

Trained metallurgists using the most up-to-date equipment and laboratories, specialize in finding the answers to **your** toughest metal cutting problems. Here at MILFORD, modern metallurgical science is teamed with practical manufacturing know-how gained in over 75 years of specialized experience. The superb result is the MILFORD Blade that will cut more metal faster and at lower cost than ever before.

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Making gage blocks exclusively enables us to shorten delivery schedules. Instead of asking you to wait many extra weeks, as is the custom right now, your order will bring you gage blocks on comparatively short notice. Our backlog is growing larger, but our production has been stepped up too.
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LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

him to conform to extreme accuracy.

There is a marked difference between the fastidious man who clothes himself in conformity with the dignity of his profession and the finicky individual who constantly wipes his hands with a piece of waste or rag in order to accelerate the minute-hand of the clock.

Noting Ed's reference to old timers in high hats got me to thinking about the advantages involved for the appropriating worker. He could cart away a medium-sized vise providing he didn't forget himself as he emerged from the building and tipped his hat at a passing acquaintance.

Jack Everett
San Francisco, Calif.

•

MEN OF MULLINS' type are met only on rare occasions.

In my machine-shop experience of about forty years I have met only two. The first was a man with whom I used to work, one of the best toolmakers I ever knew, always looked neat and clean although he was given a share of the hard and dirty jobs. He could and did turn out as good work as the next man. However, I've never met another like him. Such men are scarce, but I can see no sense in picking on them. Most of us, I dare say, have seen the opposite type of workmen.

A man with qualities such as those described is usually a good planner; he has his full equipment ready, has no lost motion or waste of time.

Years ago it was customary in

"I have a good mind to tell him that this job is ruining my permanent that I paid seventeen-fifty for."

NEW Klamp-Lok Insert Holder

SPECIAL ADVANTAGES
MAXIMUM SUPPORT given insert by clamping in direction of cutting force —OPEN FACING of insert prevents chip erosion of toolholder.
QUICK ADJUSTMENT from either top or bottom gives flexibility in clamping, removing or adjusting insert.
TRIGGER ACTION spring clamp assures fast, easy insert removal—and trouble-free servicing of toolholder.
METAL CARBIDES
YOUNGSTOWN,
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KLAMP-LOK INSERT HOLDER

● Hundreds of plants, from coast to coast, report outstanding results with the new, improved KLAMP-LOK insert toolholder. Multiple-sided cutting edges of the TALIDE insert, turned end for end, give exceptionally long service life between grinds—and can be reground without removing toolholder from the machine setup. Equally adaptable for either conventional or inverted type of mounting, the KLAMP-LOK toolholder can cut costs on your tough, high-speed production jobs.

Solid TALIDE inserts are stocked in 9 standard sizes and 4 standard grades. KLAMP-LOK toolholders are available in 10 standard styles and 70 standard sizes.

Ask for a demonstration by our sales engineer or send today for new descriptive circular No. KL-52.

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SINTERED CARBIDES • HOT PRESSED CARBIDES
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OVER 25 YEARS EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

WARPAGE? SHIFTS? DISTORTION?

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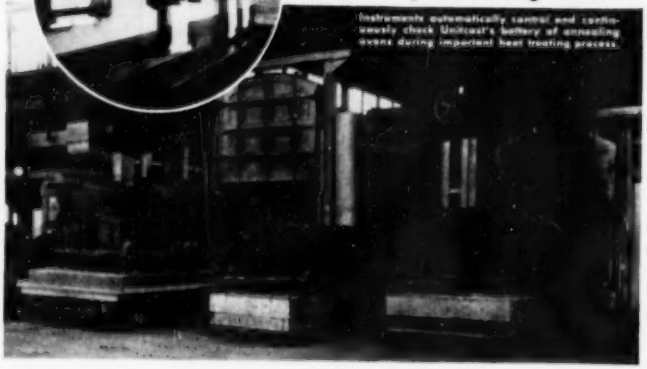
Instruments automatically control and continuously check Unitcast's battery of annealing ovens during important heat treating process.

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Unitcast doesn't sit back and rest on customer praise or previous accomplishment. Mass production of Unitcastings continues to grow by leaps and bounds as *promised accuracy* continues to be an important part of each and every unit. Unitcast offers no "stock answers" for your problem. With 30 years practical "know-how" experience backed by a complete foundry engineering staff, each job is given individual attention. It only costs a three cent stamp to have Unitcast go to work on your own "tolerance headache" so why put off writing any longer?

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QUALITY STEEL CASTINGS

Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends.
Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. In Canada: Canadian Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED

the town where we lived for the stylish wealthy to take a walk on one of the main streets on Sunday afternoons, wearing silk hats and carrying gold-headed canes.

An ordinary but respectable laborer working in the shop with us, though his salary must have been small, walked with his wife on the main street on fair Sunday afternoons carrying a gold-headed cane and wearing a silk hat.

While I realize that each of these two men was an unusual example and that not many people are likely to line up with such standards, there is no logical reason why we should not give encouragement to high standards of cleanliness for both health and efficiency.

While these men cited were both joked about, they were not criticized by their shopmates or those who knew them best.

John Mark May
Watervliet, N. Y.

NEW BOOKS

HOW TO RUN A METAL WORKING SHAPER — *Published by South Bend Lathe Works, South Bend 22, Ind. 32 pages. Price 25¢.*

A convenient and well-prepared handbook covering the setup and operation of the South Bend 7-in. shaper, this is another how-to book for both the student and the experienced machinist. It is well illustrated with photographs, diagrams, and exploded views to show the internal parts of the shaper, how to grind tools for different operations, and how to handle a wide range of jobs.

Directions are given in simple, easy-to-follow steps, and while it has been written so that the fine points of shaper operation will not go over the head of the beginner, yet the experienced operator will find many tricks of the trade and machining shortcuts helpful in his work.

•

PRACTICAL DESCRIPTIVE GEOMETRY — *By Hiram E Grant, professor and head, Dept of Engineering Drawing, Washington University, St Louis, Mo. Published by McGraw-Hill Book Co, Inc, 330 West 42nd St, New York 18, NY. 253 pages, 6x9 in. Price $4.*

Like the majority of recent American textbooks used in colleges and universities, this text employs the

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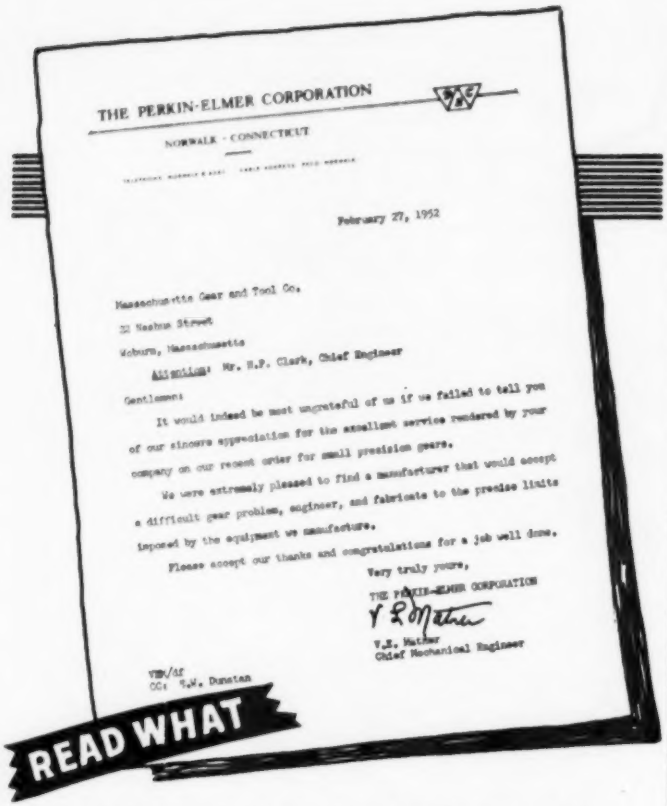
THE PERKIN-ELMER CORPORATION

NORWALK - CONNECTICUT

February 27, 1952

Massachusetts Gear and Tool Co.
22 Nashua Street
Woburn, Massachusetts

Attention: Mr. H.P. Clark, Chief Engineer

Gentlemen:

It would indeed be most ungrateful of us if we failed to tell you of our sincere appreciation for the excellent service rendered by your company on our recent order for small precision gears.

We were extremely pleased to find a manufacturer that would accept a difficult gear problem, engineer, and fabricate to the precise limits imposed by the equipment we manufacture.

Please accept our thanks and congratulations for a job well done.

Very truly yours,

THE PERKIN-ELMER CORPORATION

V.E. Mather
Chief Mechanical Engineer

VEM/AF
CC: W.N. Dunstan

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ASK US FOR ASSISTANCE ON YOUR GEAR PROBLEMS.
ILLUSTRATED LITERATURE ON REQUEST.

Mass. G&T Gears

Massachusetts Gear & Tool Co.
Woburn. Mass.

direct, rather than the Mongean, method of presenting descriptive geometry. The direct method is used because of its advantages in dealing with practical problems.

Written essentially for teaching the subject, this text attempts to correlate theory and practical applications. It stresses the importance of accuracy and for this reason has a chapter devoted to graphical accuracy. Problems are not included because a set entitled "Practical Descriptive Geometry Problems" has been designed for use with this book. Teachers preferring to use other problem books with this text may obtain the text assignment key for the problem book of their choice by writing the author.

•

ENGINEERS AND IVORY TOWERS—*By Hardy Cross, edited and arranged from published and unpublished material by Robert C. Goodpasture. Published by McGraw-Hill Publishing Co, 330 W 42nd St, New York 36, NY. 141 pages. Price $3.*

Professor Cross's definition of engineering is a good one: "Engineering is the art that deals with the application of materials and material forces."

The book is a compilation of the philosophy of Professor Cross regarding the art of engineering; as a business, as a way of thinking, and as an education. Professor Cross contributed much to structural engineering, but he did more than that. He was also an educator who believed in engineering and understood its position in the modern world. His remarks and thoughts are those of a man who understands

"Aren't you putting too much faith in signs, Johnston?"

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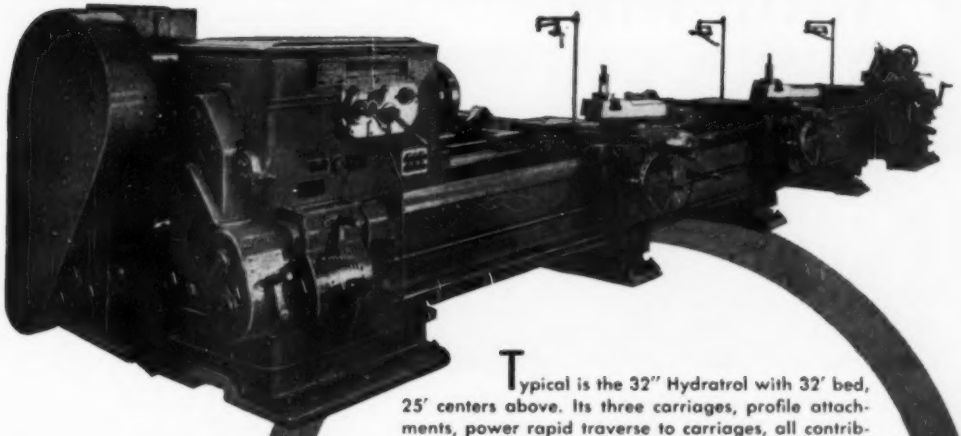
Machines Gun Tubes Better and Faster



Typical is the 32" Hydratrol with 32' bed, 25' centers above. Its three carriages, profile attachments, power rapid traverse to carriages, all contribute to doing the rough and finish turning of the O. D. on gun tubes better and faster.

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- Hydraulically operated speed changes.
- Simplicity in construction, simplicity and safety in operation.
- Automatic Slide Rule indicates spindle speeds, operation numbers, cutting speed.
- Self-compensating hydraulic friction clutches and brakes.
- Speed changes through positive clutches, gears remaining in constant mesh.
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- Perfect, safety control lubrication with filtered oil.

Six Sizes

Medium Duty 16"-18"
Heavy Duty 20"-25"
Heavy Duty 32"-36"
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MACHINE COMPANY

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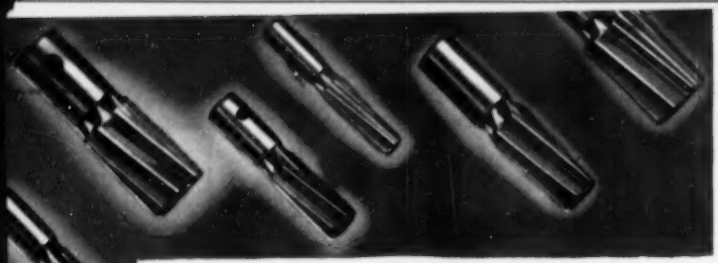

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STUB *Screw Machine* **REAMERS**

REDUCE TOOLING COSTS...

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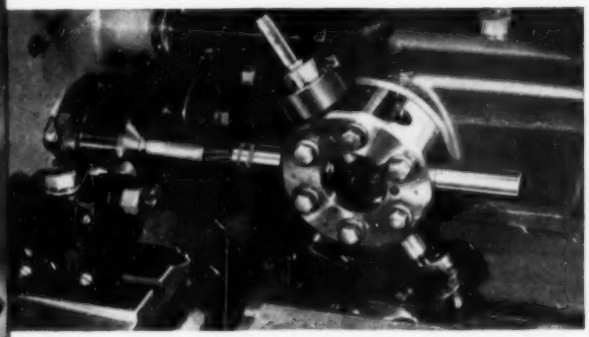

The "P & W" marking is your assurance of outstanding performance. High speed steel, skillful heat treating and correct design with ample chip clearance mean fast, free cutting performance, long life and low cost. Holes are round, straight and accurately sized. P & W FLOATING HOLDERS are recommended as an additional aid to reaming accuracy.

Any decimal size from .060" to 1.010" can be furnished promptly and inexpensively from extensive stocks of semi-finished hardened blanks. The entire range of 24 basic sizes requires only 6 standardized shanks and 5 overall lengths. Required holders, cam changes and set-up times are all greatly reduced. For complete information, write on your Company letterhead to the Branch Office nearest you — or direct to West Hartford; ask for the new Pratt & Whitney Bulletin No. 552.

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First Choice for *Accuracy*

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what he is doing and why he is doing it.

One question he covers well is the engineering graduate's view back on his own education. The young graduate thinks he should have learned more technical details because his problems are in those details. The middle-aged engineer worries about law and management problems, so he thinks he should have been taught more in those lines. The older engineer feels the lack of classical education because he no longer gets the thrill out of tackling technical problems. Only a mature mind can see, loking back, that his education was a compromise of many educations, and that it is his own responsibility to fill in the gaps that are bound to be there.

This is a book that any engineering student might read with assurance that he will gain something from the reading. It is not necessarily an entertaining book, for thinking, with most people, is not usually entertaining. But it is well written and clearly organized, and is therefore more readable than an engineering text. If the reader has any tendency toward self-education, the book should be as rewarding as any text.

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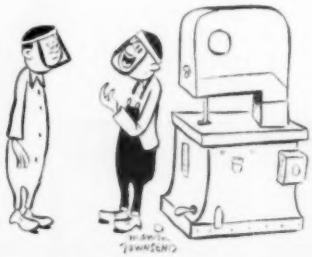
THE MILLION DOLLAR LECTURE (AND LETTERS TO FORMER STUDENTS)— *By Erwin Haskell Schell, head, Dept Business & Engrg Administration, MIT. Published by McGraw-Hill Book Co, Inc, 330 West 42nd St, New York 36, NY. 177 pages, 5½ x 8 in. Price $3.*

Thirty years ago, Prof Schell began to deliver his lecture to senior students in his department. Since then, it has been given to more than 2500 graduating seniors, 4 out of 5 of which (in older classes, we presume) have become major executives. It has been reprinted and handed around. Some 100,000 letters have passed between Prof Schell and



"My safety shield never gets steamed up anymore. I took the glass out of it."

alumni, and excerpts have been included in this volume.

Essentially, of course, this $1-million lecture is inspirational. It charts a course for life by giving suggestions. The suggestions are not really much different than those given by other professors and deans handling senior seminars—in fact, as the author confesses, they are basically a modernization of the 15th Psalm. And Prof Schell is *not* a showman; his text is straightforward and clear, without many examples and without the allegories so frequently characteristic of such a piece of advice.

The "Million Dollar" title comes from the fact that he estimated initially that it would be worth $10,000 to each of his 100 auditors in the first ten years after leaving college. And that, remember, was back in 1922, when a dollar was a dollar. The points are sound, sane, and valuable, but as an engineer, we must recall that, at that time, annual earnings for neophyte engineers were about $1000, and ten years later (1932, remember?), annual earnings for men ten years out of school topped out at only about $3000. Thus the title was originally more artful than accurate.

The advice, however, is still sound, although not as spectacular as that of a professor in another Boston college at about the same time, "Be a snob—and marry the boss' daughter."

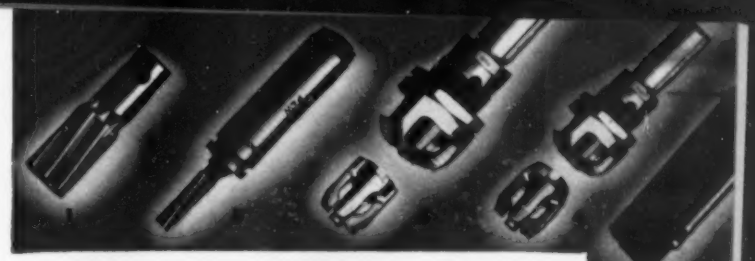
•

HEIGHT-COMBINATION TABLES — HEAT EXPANSION CALCULATOR BOOK—*Published by the DoAll Co., 254 North Laurel Ave., Des Plaines, Ill. Price $2.95.*

The process involved in selecting gage blocks to obtain a combination of the desired length for gaging is considerably simplified through the use of this book. It reduces to a minimum the figuring required to determine gage-block combinations and eliminates the somewhat tedious "last figure elimination process" and the calculations this process entails.

The tables list directly the blocks to be used in forming combinations for each dimension in the range of 0.0001 to 0.9999 in., in steps of 0.0001 in., a total of 10,000 different dimensions. More helpful still, two alternate or "substitute" combinations are listed for each dimension. The latter feature enables the user to construct the desired dimension even when certain blocks required for the "initial" combinations are not available.

The DoAll Heat-Expension Calculator, included in the book, gives the corrections that must be made in the height of combinations which



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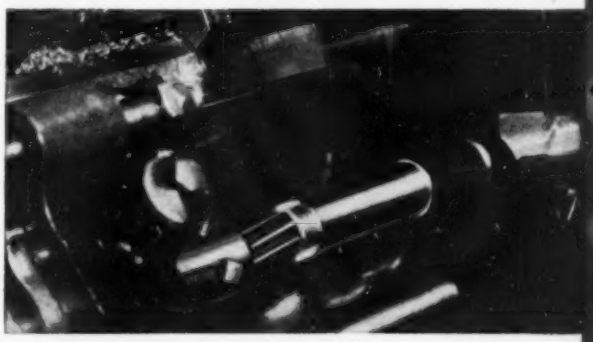

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will be used for checking parts (other than steel) at temperatures above or below 68 F, the standard measuring temperature. Such corrections are made to compensate for the differences in the coefficient of expansion between the gage blocks and the part to be checked. Corrections for this difference are not required when constructing combinations for checking steel parts, because the expansion coefficient of steel and the gage blocks is virtually identical.

With the DoAll Heat-Expansion calculator and the accompanying table of coefficients, the amount of correction for every kind of material and for the specific size being checked is simply read right from a chart.

Other useful information contained in the book includes data as to the care of gage blocks, precautions to be observed when calibrating production and toolroom gages with gage blocks, instructions for the use of wear blocks, and other helpful advice.

•

Reinforced Plastics— A Look to the Future

A REPORT by the Society of the Plastics Industry indicates that the reinforced-plastics field is an expanding one, capable of mushroom growth in a short time. SPI expects the materials to take over some of the functions of metals, particularly where the inertness and strength of the materials is an advantage. Some such applications are in piping, wear plates, tanks (for containing liquids), and in construction.

Reinforced plastics are made by embedding fibrous material in a resin (most common in fibrous glass in polyester). The result combines the resin's moldability, abrasion resistance, and colorability with the fiber's tensile strength, impact resistance, and dimensional stability.

Fibrous glass in polyester is light, resists corrosion, has poor heat conductivity, resists dents, and is fairly weatherproof.

Sales of polyester resins jumped five million lbs to 14 million from 1950 to 1951, and fibrous glass nearly doubled in the same period. More expansion is expected; the industry could possibly turn out 24 million lb of the resin right now, using all facilities.

The material molds easily, so it can replace metals in some cases, especially if metals are hard to get.

how MADISON saves 18½ hours on a boring operation for Henry & Wright*

*manufacturers of Dieing Machines, Hartford, Conn.

THE PROBLEM

To accurately produce a long taper bore and to eliminate the individual turning and hand fitting of the bushing which was previously necessary to obtain a mating fit.

THE SOLUTION

The 6 foot long bar, shown entering the work in Figs. 1 & 2, was designed and built by Madison. This step-bores the casting, as shown in Fig. 3, for the finish sizing operation. The Madison floating taper cutter (Fig. 4) reams the stepped bore to finish size.

THE RESULT

The MADISON floating action plus Madison's free-cutting two blade principle assured an accurately tapered and sized hole with the required finish and eliminated chip scoring of the surface (Fig. 5).

THE SAVING

Henry & Wright save 18½ hours by eliminating the time spent on individual hand fitting of the tapered bushings, on each Dieing Machine. Made by them in sizes ranging from 50 to 350 ton capacities.

ask the men with holes in their heads
. . . to cut your boring costs

MADISON MANUFACTURING COMPANY

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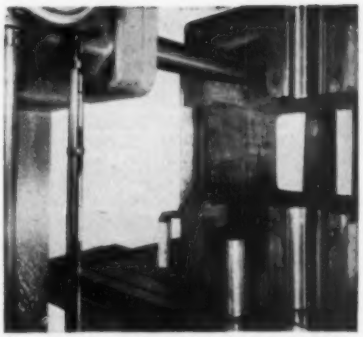


Fig. 1. Showing the rough boring set-up and the tapered bushing which fits in hole.

Fig. 2. Madison rough boring bar entering the work. The 6 foot Madison bar contains 4 cutters stepped in diameters from 5½ to 6 inches.

Fig. 3. The roughed hole. Largest diameter bored is 6".

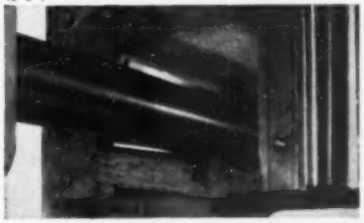
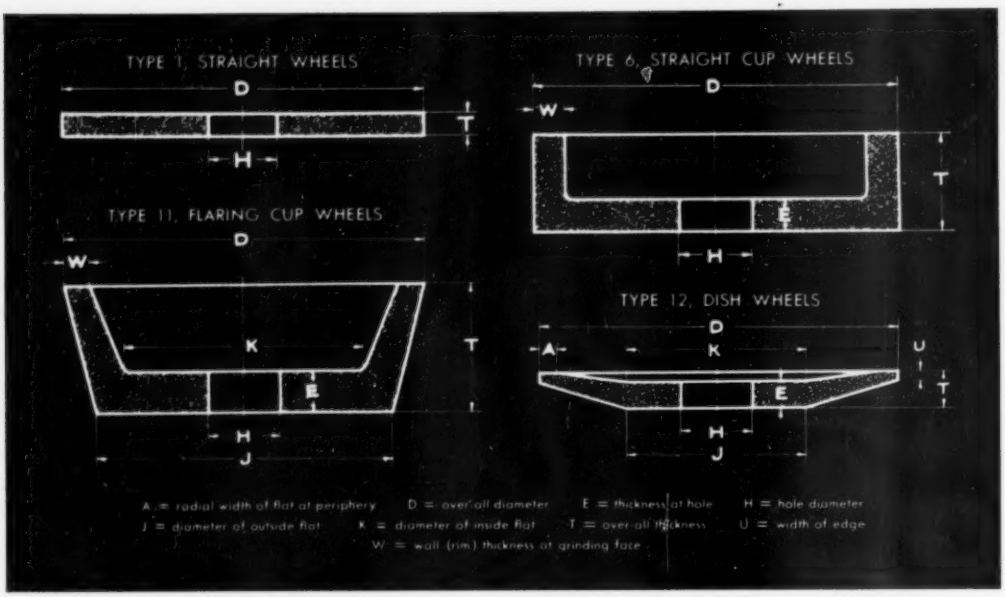


Fig. 4. The Madison taper cutter shown entering the work. Cutter is 11 inches long, with the large diameter of the taper over 6 inches.

Fig. 5. Complete job is finished in two passes. Originally several more passes were required.



WHAT ARE STANDARD GRINDING WHEELS? They are the sizes and shapes selected by the National Bureau of Standards on the basis of: (1) widest use by industry; (2) widest range of adaptability to modern grinding equipment; and (3) most commonly carried in manufacturers' and distributors' stocks.

Specifically, in tool grinding wheels alone, there are 72 different "standards" in the four types shown above. For your convenience, they are listed in easy-to-read charts in "Standard Shapes and Sizes of Grinding Wheels" issued with the permission of the National Bureau of Standards.

How standard grinding wheels help you 3 ways

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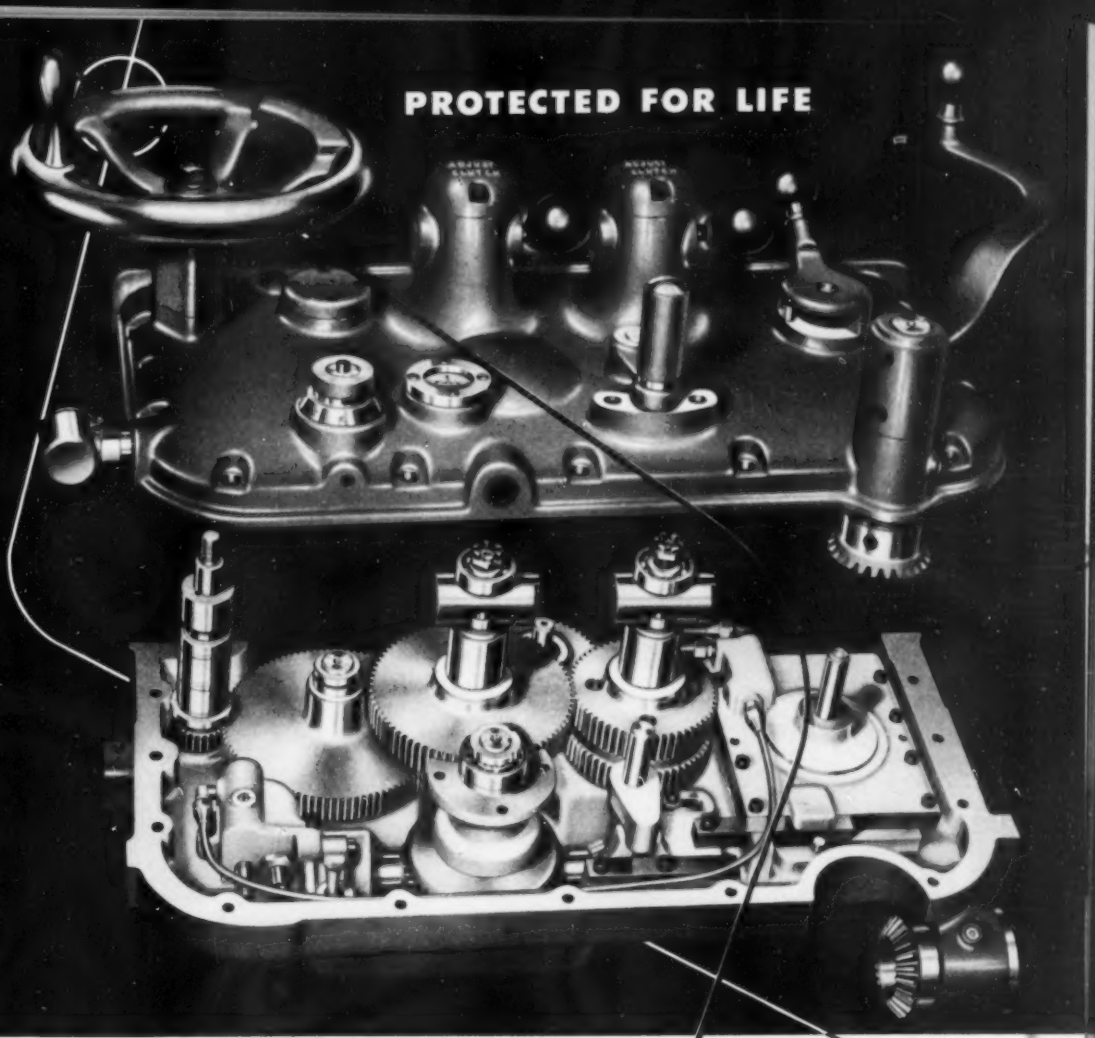
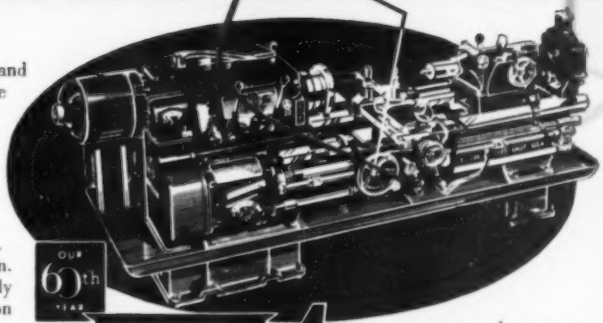


All Axelson precision apron gears, bearings and shafts receive adequate lubrication including the sliding bevel gears, which are immersed in oil. The apron, being wholly enclosed, eliminates chips, dirt and other foreign matter. The Axelson apron has its *own* pressure oiling system, with visual oil gage. This same system also delivers oil under pressure to the carriage ways, the cross slide and other critical areas. The split nut too, receives automatic lubrication. The oil pump and the apron clutches are easily adjusted from the front side. The same attention to detail carries through the entire Axelson Lathe line, where precision construction assures not only smooth operation, but also high resistance to wear and shock loading.



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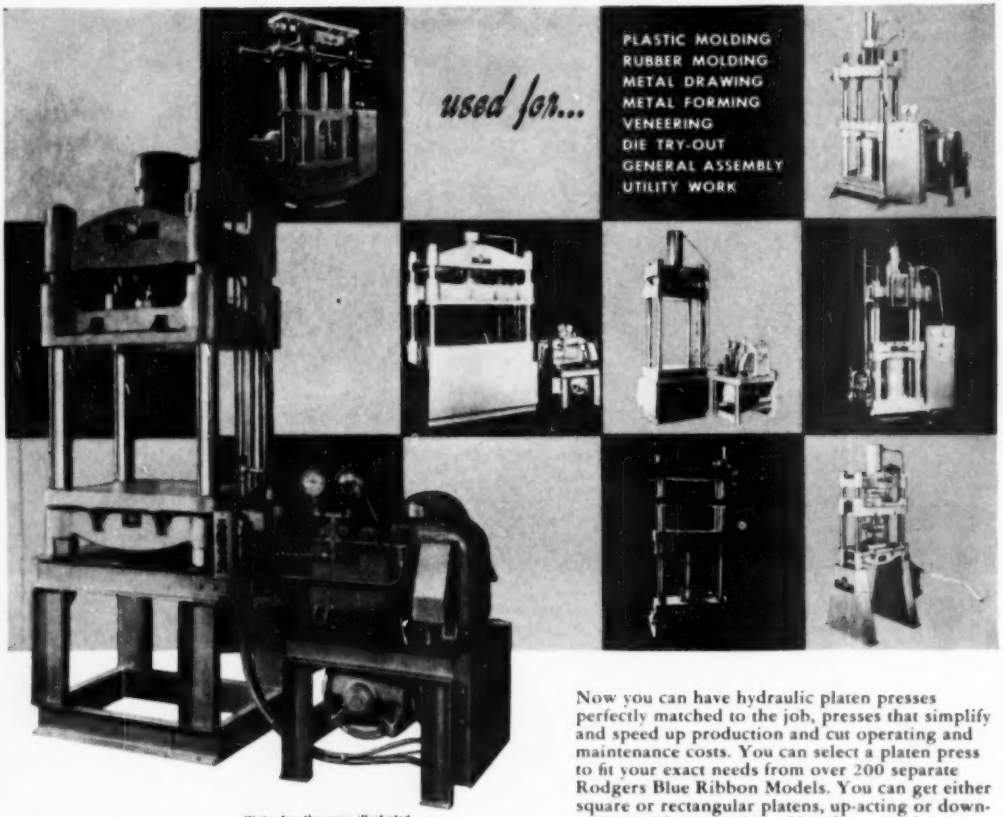

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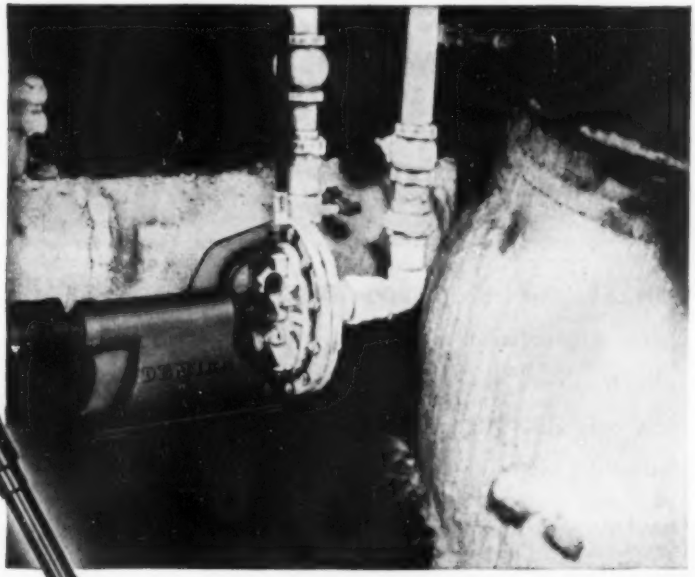

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These stainless steel impeller shafts are manufactured from Free-Machining ENDURO, Type 416, by The Deming Company, Salem, Ohio. In the photo above, a Deming Centrifugal Pump is shown pumping brine in a packing house.

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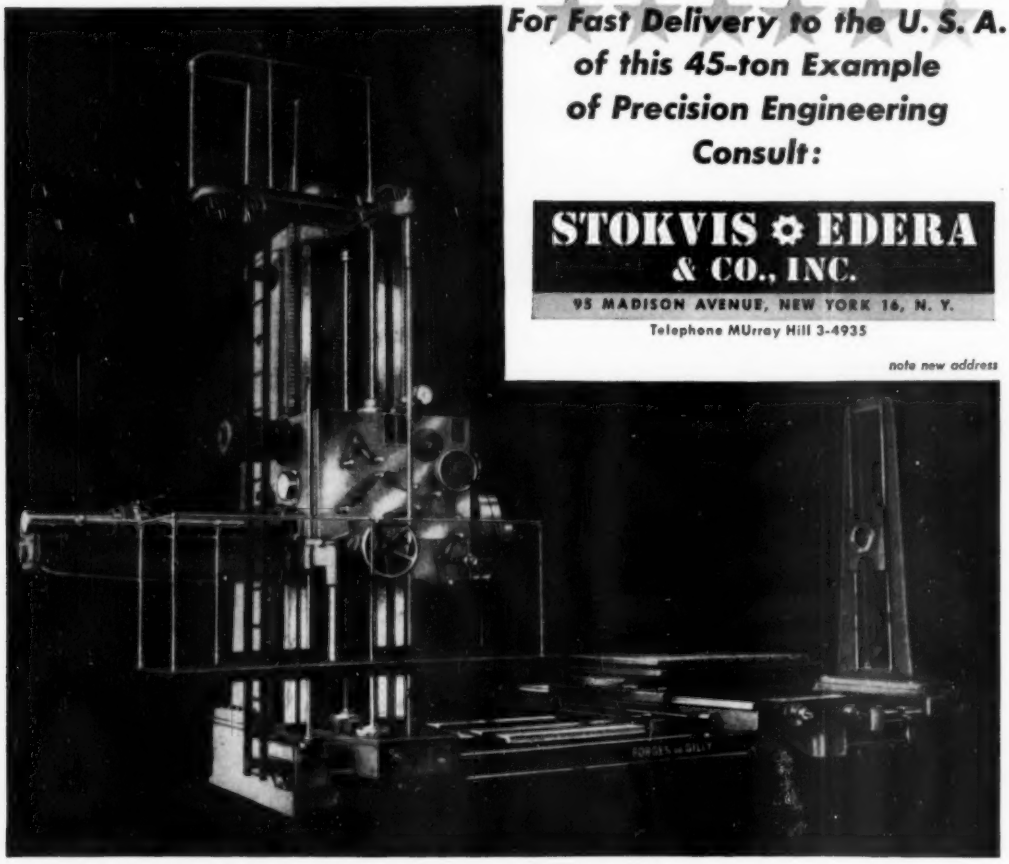

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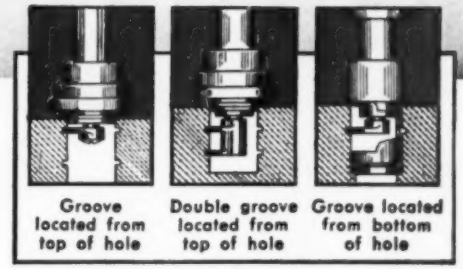

Groove located from top of hole | Double groove located from top of hole | Groove located from bottom of hole

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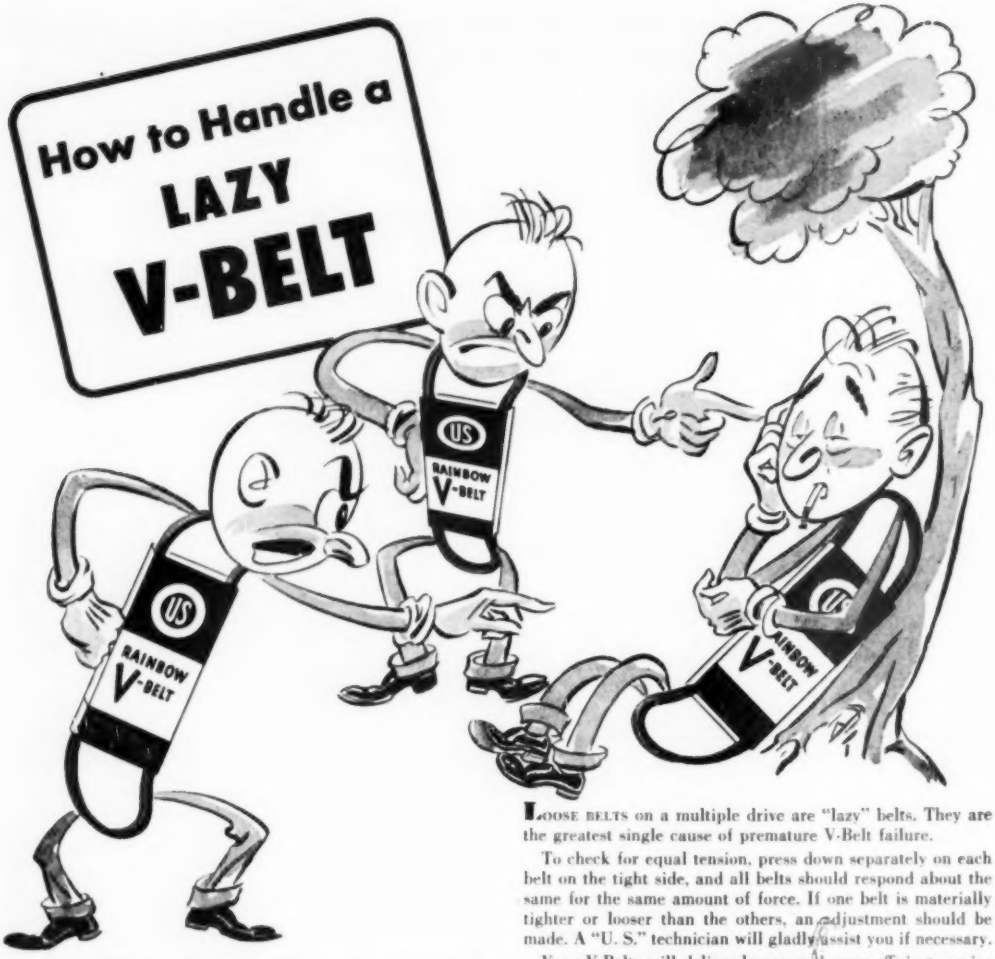
How to Handle a LAZY V-BELT



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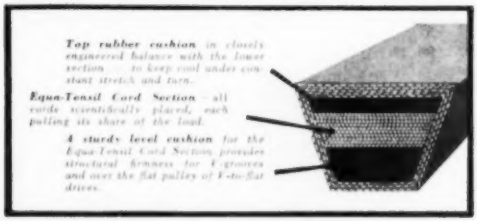
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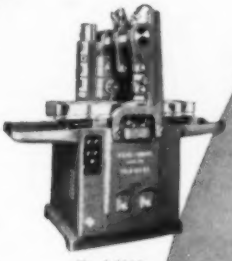

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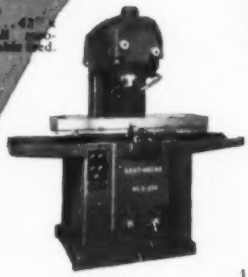

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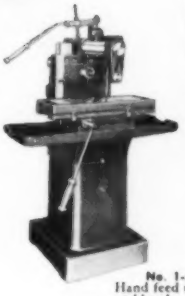
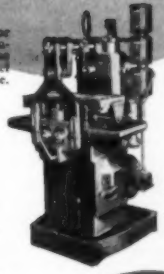
No. 1-V.
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.



No. 1-M.
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head counter-balance.

No. 1-14DS.
Double spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.



No. 1-8.
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.

KENT-OWENS REPRESENTATIVES

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BUFFALO — Don W. Patterson
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DALLAS — Hunter Machine Tool Co.
DAYTON — Geoger Mach'y Company
DETROIT — A.C. Habenicht Mach'y Co.
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MONTREAL — P. P. Barber Mach'y Co.
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CALL ON KENT-OWENS FOR MILLING MACHINES

.0001" ACCURACY

THE DRESSER WITH A MICROMETER FEED

J & S "Fluidmotion"* Radius and Angle Dressers

Dress* Two Angles *Tangent* to a radius *in ONE CONTINUOUS MOTION

ELIMINATE GAGE BLOCK—MASTER GAGE SETTING—JO BLOCK—PARALLEL BAR—SURFACE PLATE—HEIGHT GAGE—DIAL INDICATOR—CHATTER MARKS OR TOOL MARKS AND **COSTLY MAJOR REPAIRS.**

WITH J & S "Fluidmotion," it is not necessary to preset the diamond, all that is needed is a micrometer and a simple hex wrench.

SETTING UP is easily done right on the surface or cylindrical grinders.

TOOL GRINDERS are at a premium—by employing J & S "Fluidmotion" you can very easily develop top notch tool grinders.

WE STATE and can back up—of the last 3000 "Fluidmotion" Radii & Angle Wheel Dressers sold in the last 10 years—LESS THAN 1% HAVE BEEN RETURNED FOR SERVICING and NONE DUE TO WEAR. The average cost for servicing is approximately $4.00 per year, over a 5-year period.

BECAUSE "Fluidmotion" is made from the finest HIGH-CARBON, HIGH-CHROME, hardened, ground and lapped alloy steels, highly resistant to abrasive action.

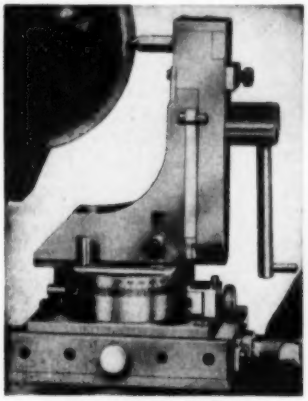
GIBS & V-WAYS are positioning surfaces only for dressing angles which eliminates the conventional method of movements on dovetails which also is always exposed to grit and coolants.

RADII precise sharp contours, concave or convex, at a full 180°, are obtained consistently with (GUARANTEED) 0.0001" accuracy.

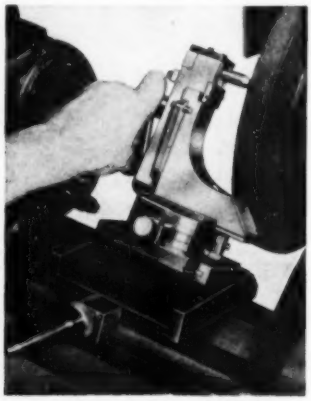
CONCAVE RANGE—1/32" to 3 inches
CONVEX RANGE—zero to 9 inches

Special dressing equipment can be furnished to dress wheels up to 36" in diameter. Dresser swivels on Stainless Steel Ball Bearings which are completely protected from dust.

ANGLES Hold intersecting angles 12 to 15 seconds. THIS is actuated by upright and handle. Setting up two angles requires 10 seconds. Setting two angles and radius requires less than 3 minutes.



ON SURFACE GRINDERS
MODEL "C" SHOWN



UP TO 36" DIA. WHEELS
ON CYLINDRICAL GRINDERS

MODEL "H-24" up to 24" wheel
MODEL "H-36" up to 36" wheel

HEIGHT OF DIAMOND POINT FROM TABLE IS AS FOLLOWS:
J & S "FLUIDMOTION" SERIES

Model "C" up to 14" dia. wheel—with micrometer feed is 8⅝" above table.
Model "E" up to 14" dia. wheel—without micrometer feed is 7½" above table.
Model "FG" up to 7" dia. wheel—with micrometer feed is 6¼" above table.
Model "F" up to 6" dia. wheel—without micrometer feed is 5" above table.
Model "HC" up to 36" dia. wheel—with micrometer feed is 15¼" above table.
Model "H" up to 36" dia. wheel—without micrometer feed is 14" above table.

For shops having less frequent wheel dressing requirements our less expensive "Form Master" Radius & Angle Wheel Dresser is available. Wheel capacity, up to 10" and diamond is 7¾" above table.

***DELIVERY* for month of August on above Models:**
3 WEEKS AFTER RECEIPT OF ORDER. F.O.B. EAST ORANGE, N. J.

OTHER "Machine Shop TIME SAVERS" by J & S:
J & S "All-Purpose" Jaw Clamps. Special Purpose Form Tools of Solid Carbide—High Speed Steel.

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Representatives in Principal Cities

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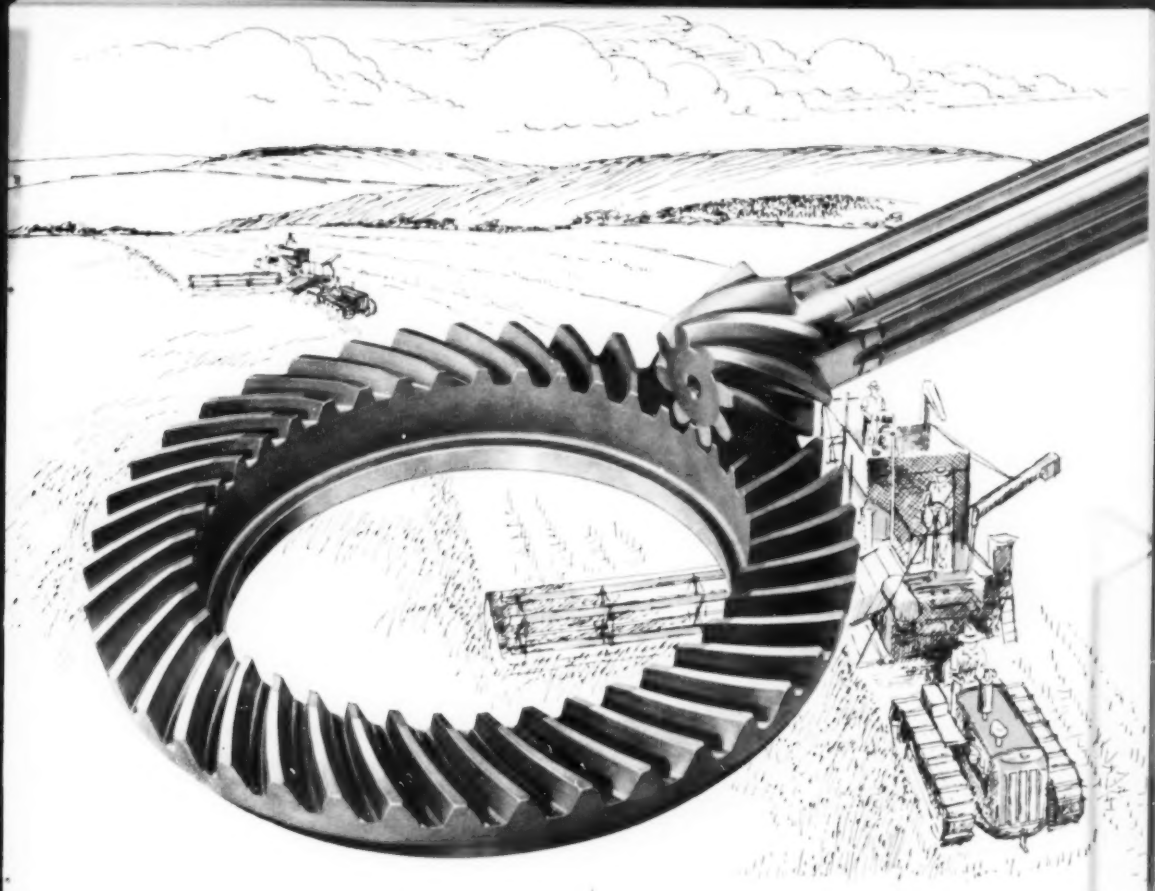

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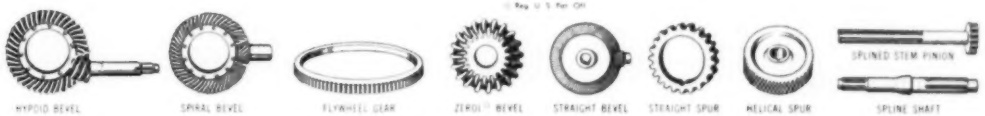
FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS



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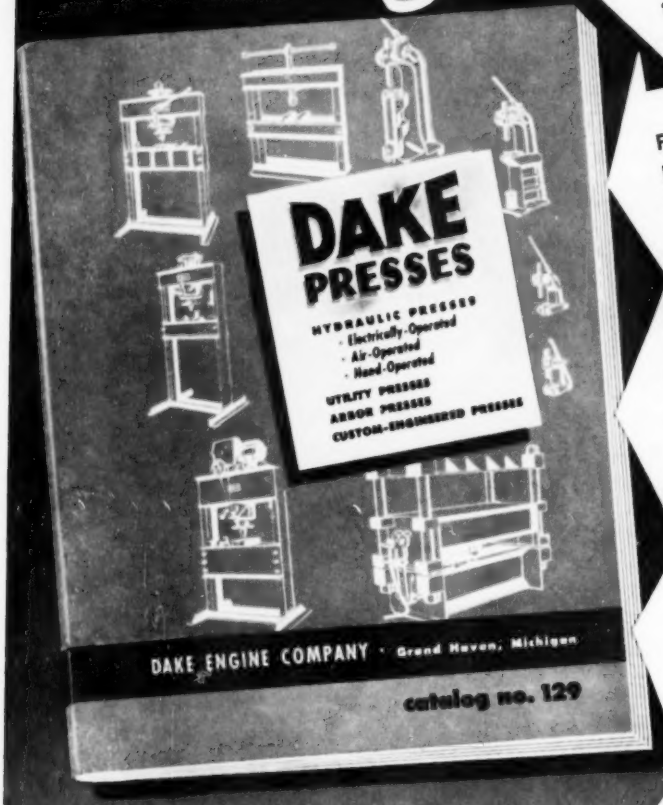

Contains specifications and technical data on 40 standard models as well as many special presses

Fully describes important Dake operating and construction features

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Hand, air, and electric presses with capacities from 1 to 125 tons

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arbor and hydraulic
PRESSES

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(TRICHLORETHYLENE)

cleans appliance parts in less than a minute!

STOVE BURNER PARTS are thoroughly cleaned at an average rate of 3000 parts hr. Vapor degreasing with "Triclene" D quickly removes cutting oils, chips and drawing compounds . . . leaves no spots . . . requires no afterdrying.

REFRIGERATOR PARTS are prepared for assembly by vapor degreasing with "Triclene" D. Dust, dirt and oil are removed in one fast step. Equipment is simple to operate, easy to maintain and efficiently re-uses solvent for maximum economy.

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"TRICLENE" D is designed for vapor degreasing by the pioneers of the Trichlorethylene field. In wide use for many years, "Triclene" D is fully backed by Du Pont research plus the practical experience of Du Pont technical representatives.

OUTSTANDING PROPERTIES OF "TRICLENE" D

- Stable
- High Purity
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- Withstands moisture and heat
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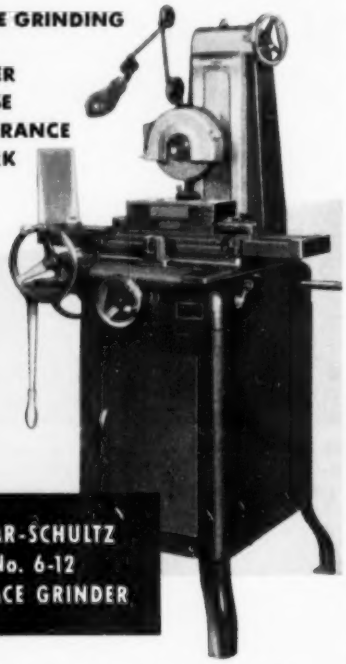

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HERE is the New Grinder Sensation of the decade . . . with all the features the metal working industry has been talking about PLUS—

Flatness and parallelism GUARANTEED to within 2/10 (.0002). Low First Cost. Easy Operation. 8 to 10 Weeks Delivery.

The excellent performance of this machine tool, that has been *proved* in so many shops, is the net result of unusually sturdy design, fine quality materials and the untiring efforts of skilled craftsmen who know what a fine precision machine tool should do.

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A heavy duty, precision tool room machine built for sustained accuracy in both tool room and in production.

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for larger precision work

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Model
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are accurate, reliable and built to stand hard usage.

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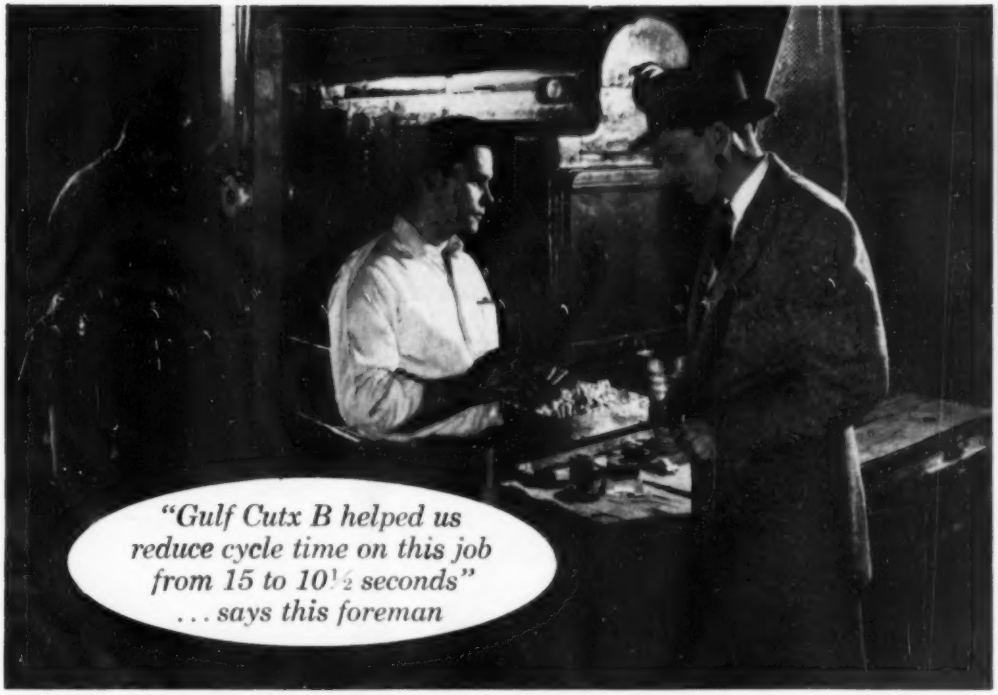
Makers of Dial Gauges Since 1896

fuses finished faster with GULF CUTX B



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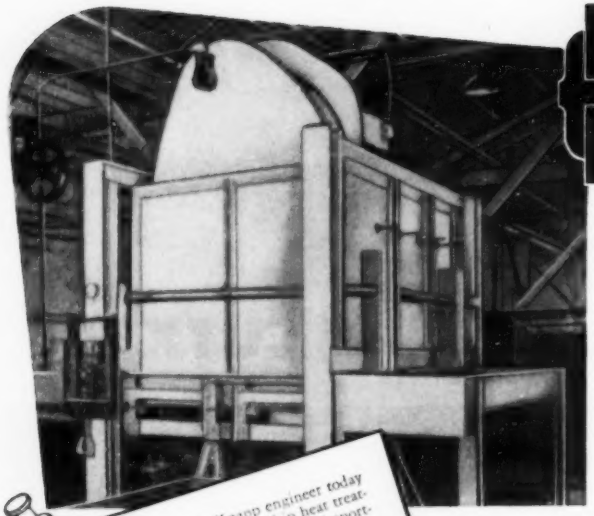

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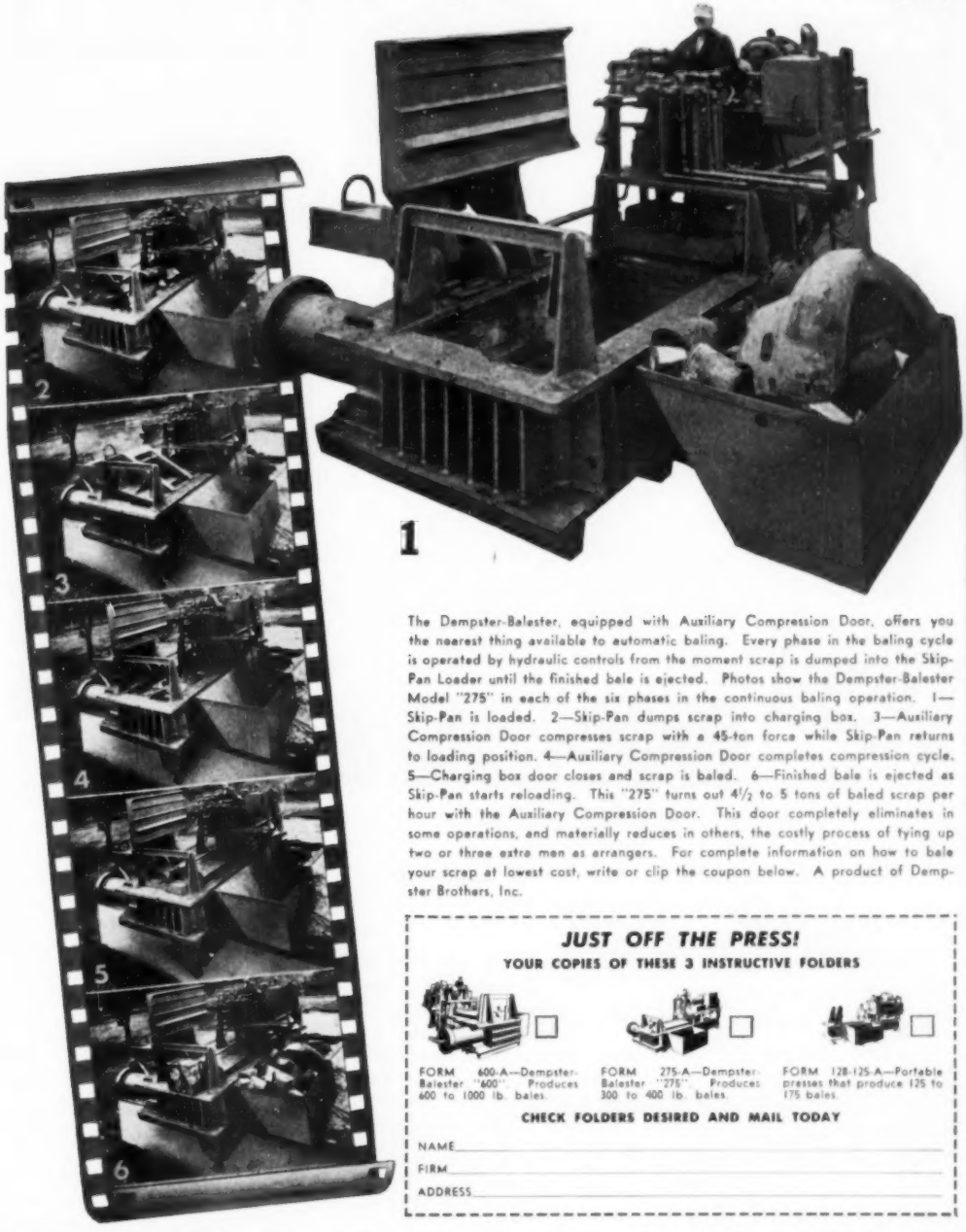

The Dempster-Balester, equipped with Auxiliary Compression Door, offers you the nearest thing available to automatic baling. Every phase in the baling cycle is operated by hydraulic controls from the moment scrap is dumped into the Skip-Pan Loader until the finished bale is ejected. Photos show the Dempster-Balester Model "275" in each of the six phases in the continuous baling operation. 1—Skip-Pan is loaded. 2—Skip-Pan dumps scrap into charging box. 3—Auxiliary Compression Door compresses scrap with a 45-ton force while Skip-Pan returns to loading position. 4—Auxiliary Compression Door completes compression cycle. 5—Charging box door closes and scrap is baled. 6—Finished bale is ejected as Skip-Pan starts reloading. This "275" turns out 4½ to 5 tons of baled scrap per hour with the Auxiliary Compression Door. This door completely eliminates in some operations, and materially reduces in others, the costly process of tying up two or three extra men as arrangers. For complete information on how to bale your scrap at lowest cost, write or clip the coupon below. A product of Dempster Brothers, Inc.

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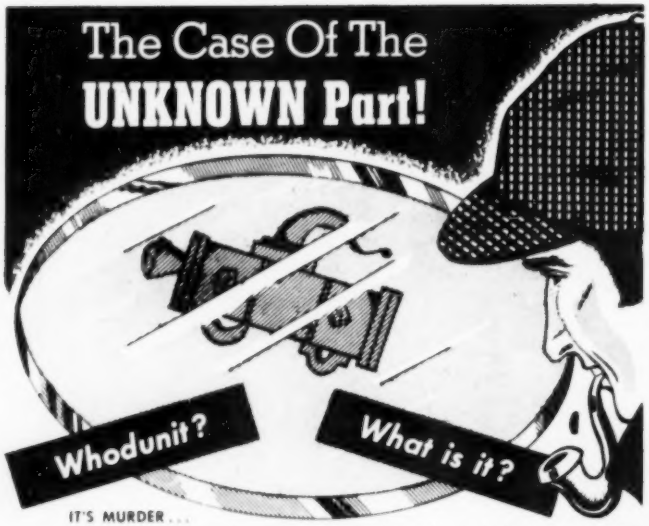

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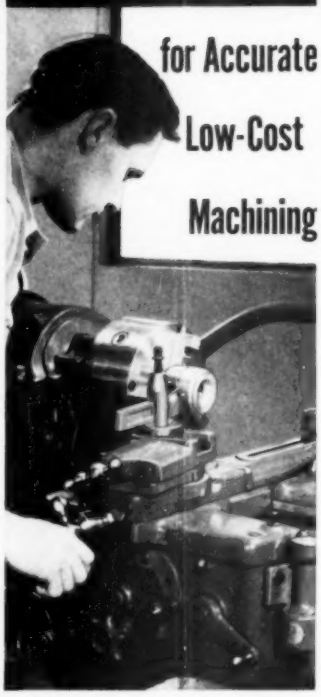
SOUTH BEND 13" LATHES



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Write for complete information on South Bend Lathes, Drill Presses and Shapers.

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- **Swing** — 13⅛" over bed
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- **Collet Capacity** — 1"
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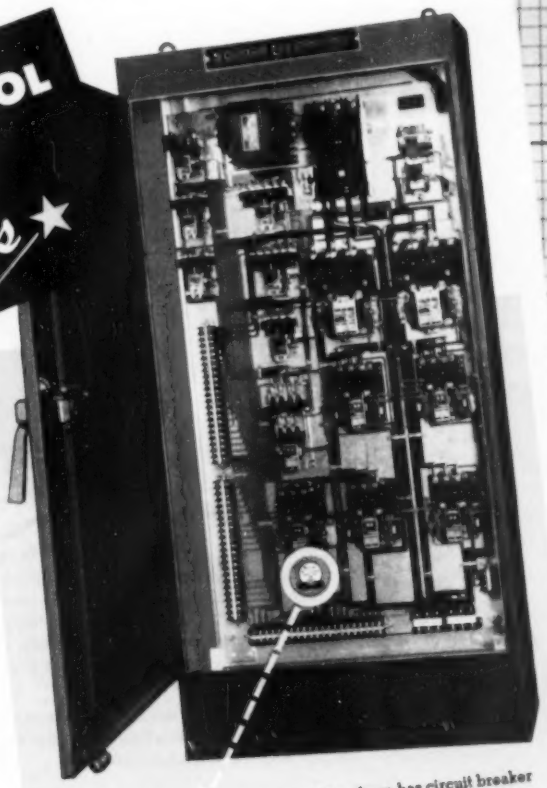

Plus **DESIGN LEADERSHIP** *in circuits, components, accessories and enclosure fabrication . . .*

Plus **FIELD ENGINEERING SERVICE** *through experienced, practical engineers stationed in principal cities.*

Electrical standards for machine tools are published by the NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION for general industry use and by the JOINT INDUSTRY CONFERENCE for the mass production industries. By specifying control built to these standards, users benefit from the combined experience and judgment of engineers in a wide variety of industrial plants. The construction features required assure maximum safety, uninterrupted production and long service.

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Your Square D Field Engineer will be glad to work with you on any electrical control problem.

Engineered, Factory-Assembled and Tested by

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Watch for Square D's Display Coach — Now on Tour!

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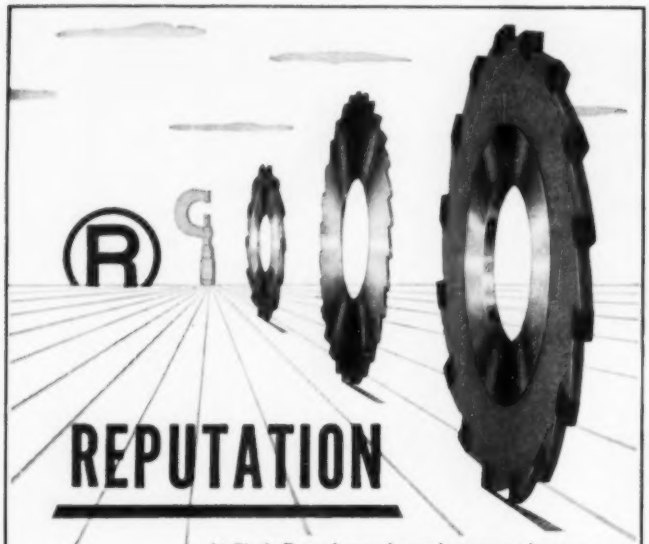

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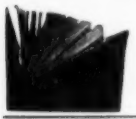

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METHODS-TIME MEASUREMENT

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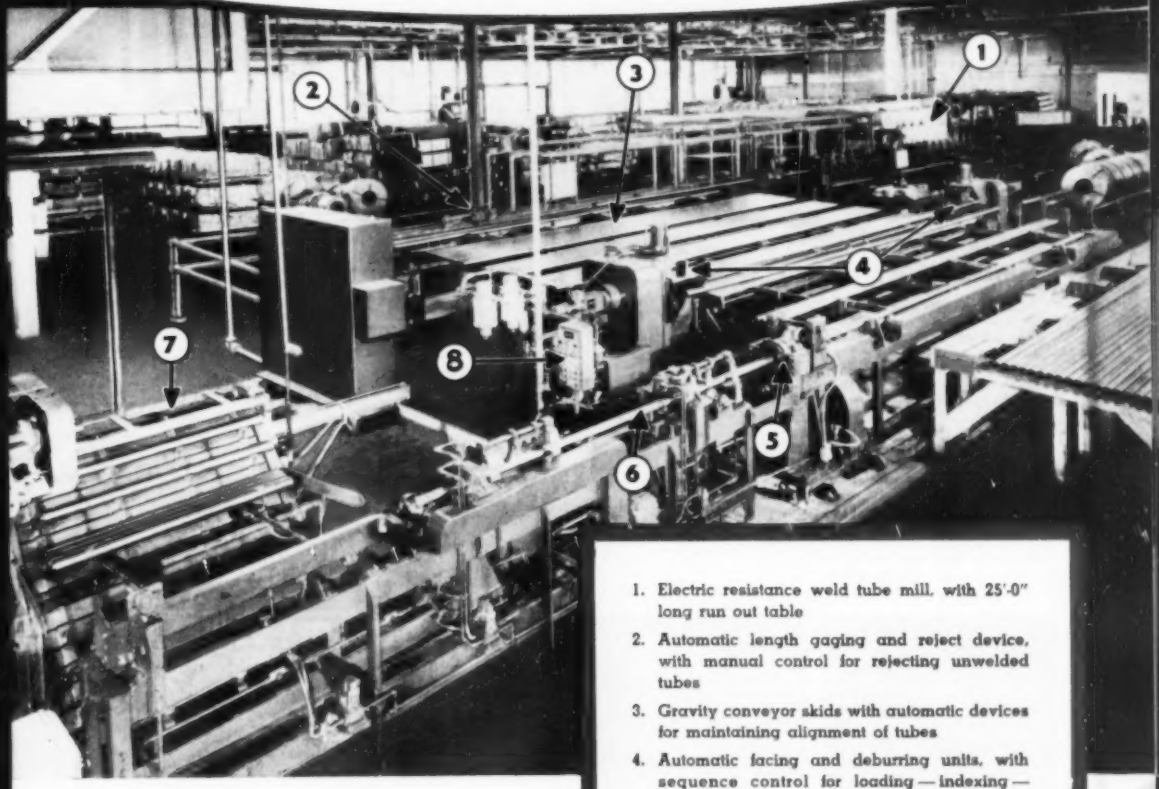

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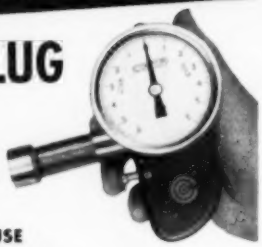

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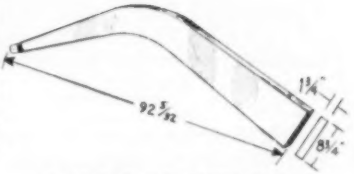
Pines Size 4 Automatic Bender forming loader booms in tractor plant. Tools are shown open after the 41° bend is completed. Production capacity is 50 booms per hour, one operator.

41° Edge Bend in Heavy 12-Gauge Stock Simplifies Production Problem

Here's another example of how cold-forming the "Pines-Way" speeds production and lowers costs. The setup illustrated shows tooling on a Size 4 Bender used for edge bending a heavy 12-gauge (.112″) hollow tractor loader boom. The pieces are fabricated with a gradual taper, and two straight U-shaped strips are arc-welded together. By adopting the Pines bending method, instead of making curved pieces on a press, a substantial reduction in die cost and scrap losses are affected.



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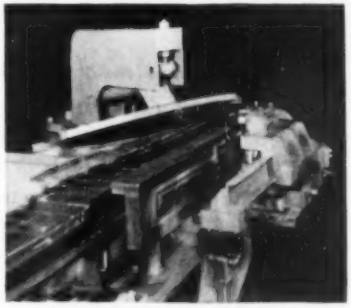

View of floating-type flexible mandrel and tapered sliding pressure die. Automatic air-operated support holds mandrel in proper alignment on forward stroke, retracts for clamping. Same machine with different tooling also cold bends 3″ heavy wall pipe for undercarriage loader supports.

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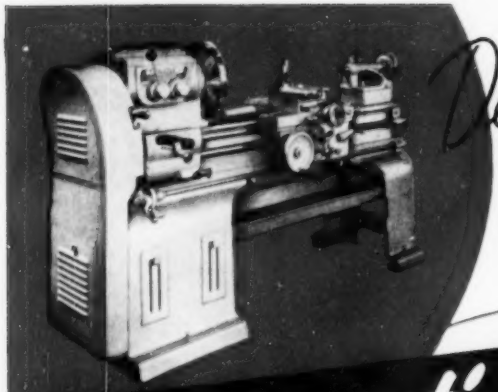

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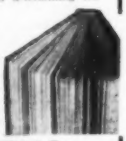

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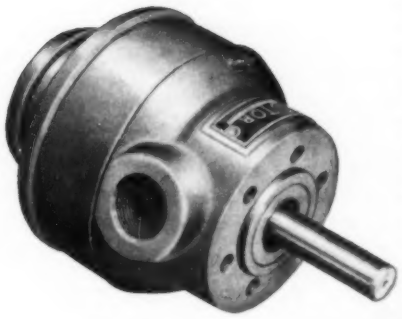

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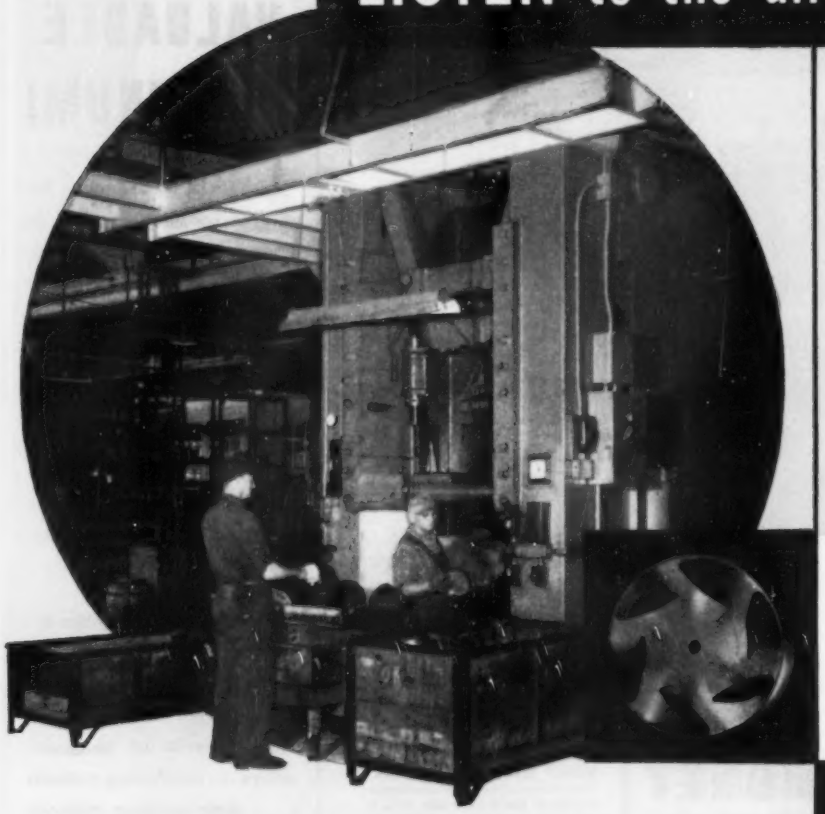

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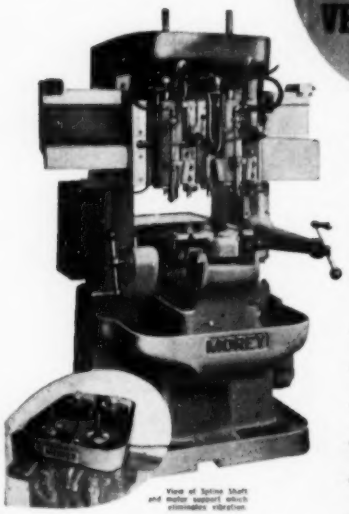

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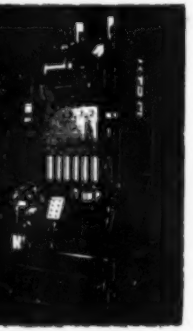

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Just as the Peacock in Aesop's fable excelled in beauty of plumage but not of voice, so does no single cutting fluid excel in every desired characteristic.

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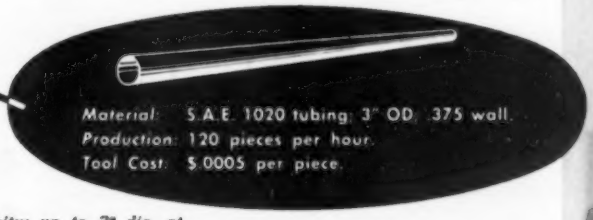
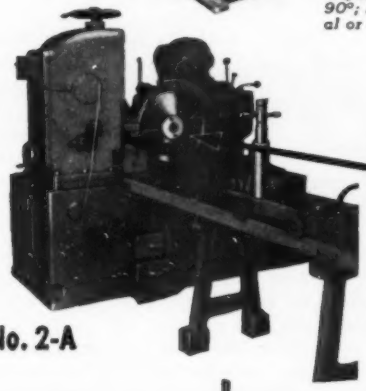


Material: S.A.E. 1020 tubing, 3" OD, .375 wall.
Production: 120 pieces per hour.
Tool Cost: $.0005 per piece.

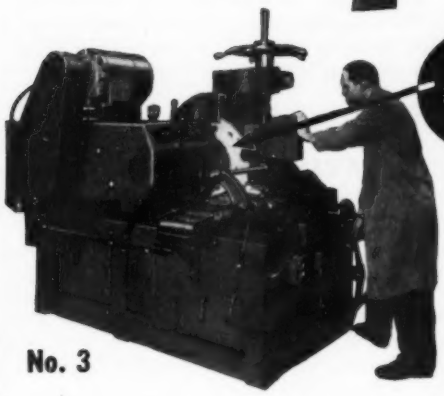
Capacity: up to 3" dia. at 90°; 2⅛" dia. at 45°. Manual or automatic stock feed.



No. 2-A

Material: S.A.E. 1020, 5" dia.
Production: 60 pieces per hour.
Tool Cost: $.001 per piece.

Capacity: up to 6⅛" dia., 6" square. Manual or automatic stock feed.



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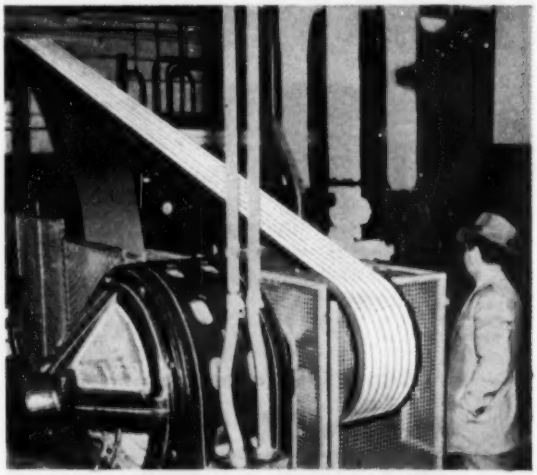
On the other hand, when a straight sided V-Belt (Figure 2) is bent, the sides bulge out, preventing the belt from fitting evenly in the sheave groove. This causes *extra wear* at the points shown by arrows. (Figure 2A).



Make this simple test yourself...

Hold a straight sided V-Belt as it would be bent around a sheave. Take the sides of the belt between your finger and thumb. You can *feel* the bulges in the sides—the bulges that prevent an even fit in the sheave groove and cause extra wear.

Now do the same thing with a Gates Vulco Rope. You can feel the sides fill out. You can see why they press firmly and evenly against the sides of the sheave groove—giving you longer belt life—lower belt costs.

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This big 18 foot flywheel on an ammonia compressor at the Terminal Warehouse Co., St. Joseph, Missouri, was originally driven by a flat belt.

Mr. I. McKee, plant superintendent says, "We needed a drive we could depend on, so we installed a Gates Vulco Rope drive right on the flat pulley of the compressor. This conversion is saving us about $1,000 a year."

C5-526-A

Gates® VULCO ROPE DRIVES

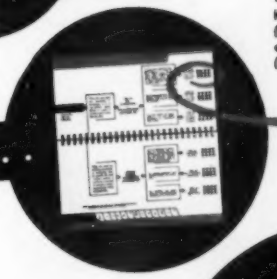
THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker
of V-Belts

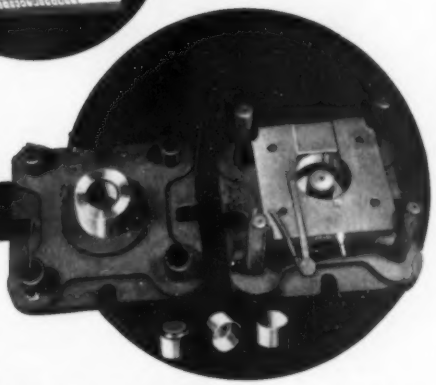
How ONE TOOLMAKER . . .

—then use HAMPDEN (Oil-Wear) or No. 610 (Air-Wear)

USED THIS GUIDE . . . . . .



TO HOLD DOWN UNIT COSTS . . .



AT which step in your tooling process would you welcome real help in reducing tool and die costs? Tool Steel Selection? Heat Treating?—or on-the-job "Trouble-Shooting"? Here's how you, like the maker of the Dies shown here, can start to reduce costs with a Method that helps you at *all 3* steps.

First, to simplify selection, use the handy Selector Section in the Carpenter Matched Tool Steel Manual. Quickly and surely, it enables you to put your finger on the proper steel for best results. Next, to further insure tool and die performance, use the Manual's complete heat treating instructions—they have been simplified beyond anything previously known. It's easy to get started—use the Carpenter Matched Set Method to help you "trouble-shoot" your present tool and die jobs.

For better, lower-cost tooling, put this practical, easy-to-use Method to work, now. Ask for the 189-page Carpenter Matched Tool Steel Manual—just see your Carpenter representative. The Carpenter Steel Company, 109 W. Bern Street, Reading, Pa.

Job:
Compound Blank and Draw Die for forming .031", ¼-hard brass Vent Valve Bodies at the rate of 103 per minute on a punch press.

Problem:
Unit costs were on the upswing because the old dies wore too rapidly, causing frequent and costly machine shutdowns for regrinding.

Solution:
Looking for a die steel with maximum wear resistance, the toolmaker referred to the Selector Section in the Carpenter Matched Tool Steel Manual, and quickly arrived at Carpenter *Hampden* (Oil-Wear).

Heat Treatment:
Simplified instructions in the Manual were followed.

Results:
2 hours of costly machine downtime were eliminated *each day*—production per grind *rose over 300%!* As a matter of interest, the toolmaker takes off approximately .0005" per stoning and gets about 100 grinds from the Blank and Draw Die.

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

Call Your Nearest Carpenter Warehouse or Distributor

DON'T WAIT... COOPERATE! The U.S. Needs Your Steel Scrap, Now

Carpenter

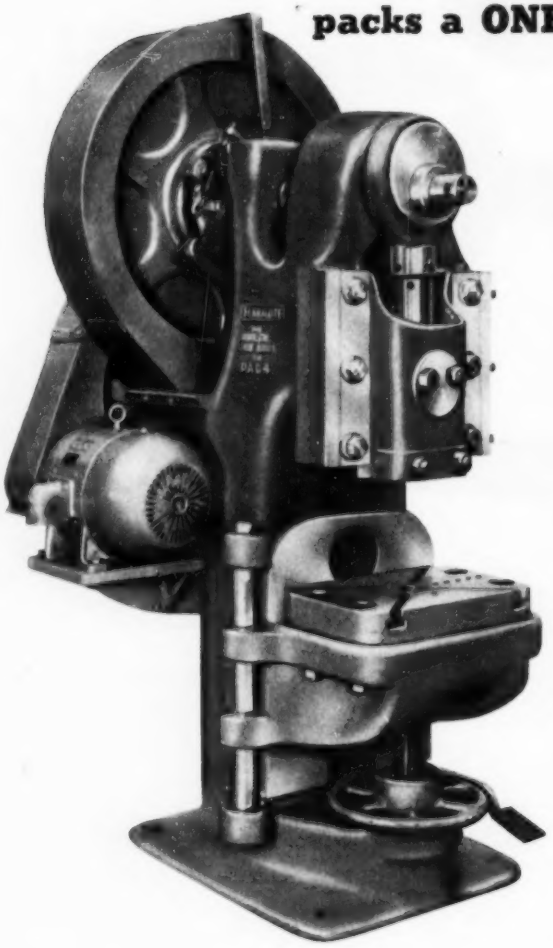
MATCHED TOOL & DIE STEELS

Export Department: Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"

For your convenience, Carpenter carries warehouse stocks in principal cities throughout the country

This FERRACUTE 'P' PRESS

packs a ONE-TWO PUNCH



One - adjustable bed
Two - horn tool

Bed in working position is adjustable for various die heights. Bed is tongued for alignment. Securely bolted to the frame casting and supported at the center by extra large adjusting screw. Bed is also hinged so that it will swing clear to allow a horn to be inserted in frame for punching, riveting, or forming large angular pieces.

FERRACUTE
Double Purpose Press PAG-4
Especially useful when employed on work requiring frequent changes of dies of various heights.

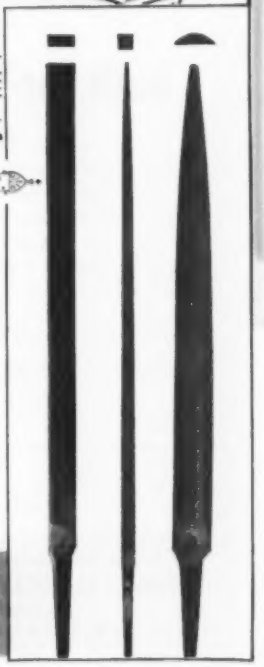
FERRACUTE

FERRACUTE MACHINE COMPANY

Since 1863 Manufacturers of Power Presses and Special Machinery BRIDGETON, N. J., U.S.A.

POP'S school of Filing

AIN'T THAT JUST LIKE STOOP? HE SAYS THE FINS ON THAT DIE CASTING REMIND HIM OF THE ALPS! SO HE'S KNOCKIN' 'EM OFF WITH A SWISS PATTERN FILE!
SWISS PATTERNS ARE FINISHING FILES--WHICH IS WHAT STOOP WILL BE WHEN POP CATCHES HIM.
HE'LL GET THE POINT--RIGHT WHERE HE DON'T WANT IT!
STAN RANDALL



LIKE most production-wise foremen, Pop is a bug on tools. He knows that Nicholson X.F. (Extra Fine) Swiss Pattern Files, for example, are the finest finishing files you can buy. And heaven help the man who uses 'em on the wrong jobs!

Nicholson Swiss Pattern Files are widely used for removing burs left from previous machining operations, rounding out slots, smoothing small parts, and final finishing on all sorts of delicate and intricate pieces. They come in seven degrees of coarseness, scores of shapes and sizes. Available through your industrial distributor.

Send for the Nicholson booklets, **"Ten Special File Types"** and **"File Filosophy."** They're FREE.

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NICHOLSON... a file for every purpose

IT'S A
Mac-it®
PRONOUNCED "MACK-IT"

Mac-it Stripper Bolts—heat-treated for strength, head concentric with body, ground to close tolerances.

Built for Strength!

For the toughest kind of fastening jobs, the complete Mac-it line of heat-treated, alloy steel screws will give you the strength you need *where you need it!*

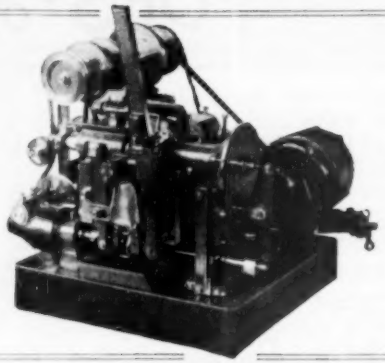
Mac-it's 38 years' experience in the manufacture of these top-quality fasteners is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada.

Other Mac-it products include:

Hollow Lock Screws	Socket Screw Keys
Socket Head Cap Screws	Square Head Set Screws
Hollow Set Screws	Hexagon Head Cap Screws
Hollow Pipe Plugs	. . . and many others

Marketed Nationally Since 1913 by
STRONG, CARLISLE & HAMMOND COMPANY
Cleveland 13, Ohio
Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

WALTHAM
PINION AND GEAR CUTTING MACHINES



Fast, Convenient, Compact, Accurate

Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS
High Street, Waltham, Mass.

Automatic Dieing Machines combine high speed with long die life in production of metal stampings.

See pages 64-65 June 9th, American Machinist

HENRY & WRIGHT *Division of Embart Mfg. Co.* HARTFORD, CONN.

ATTENTION REAMER BUYERS
70 YEARS CHOICE OF TOOL EXPERTS

REAMERS, MILLING CUTTERS, END MILLS, SPECIALS
ALVORD-POLK TOOL CO. Millersburg, Pa.

LELAND-GIFFORD
the BIG NAME in Drilling Machines
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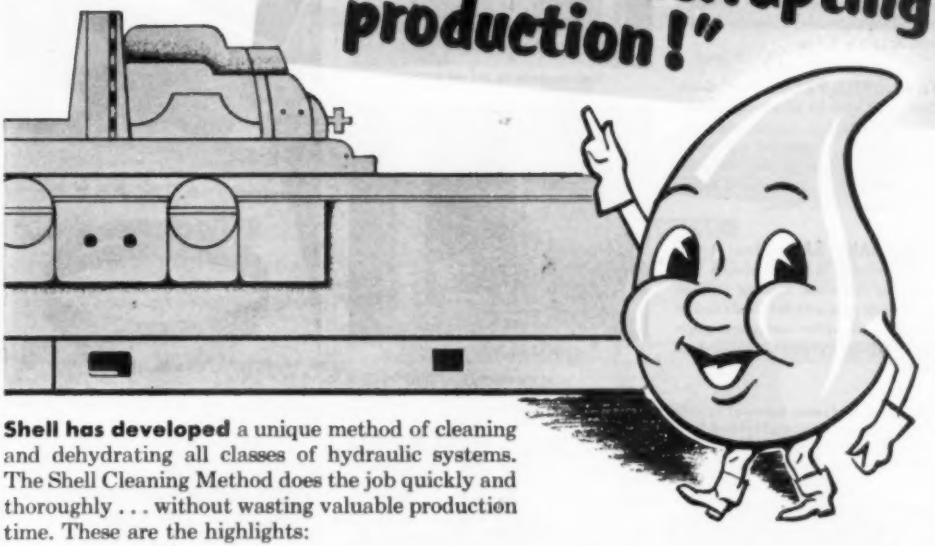
ROCHESTER 16
P. O. Box 67
Rossiown Station

"Now you can clean hydraulic systems without interrupting production!"



Shell has developed a unique method of cleaning and dehydrating all classes of hydraulic systems. The Shell Cleaning Method does the job quickly and thoroughly . . . without wasting valuable production time. These are the highlights:

It's thorough . . . This tested method employs a special oil that can do a multiple cleaning job while your machines operate during a regular production shift.

It dehydrates . . . removes sludge . . . The special cleaning oil will materially dehydrate wet sludges in a system and remove them . . . at the same time it has high solvency for products of oxidation. It coats critical surfaces with an effective rust preventive so that no part of the mechanism is unprotected while the cleaning oil is drained from the unit.

It costs little . . . The cost of using the Shell Cleaning Method is surprisingly low, since no expensive material nor equipment is required.

". . . and when it's clean . . . fill it with Shell's Improved Tellus Oil"

This is the one inhibited oil that:

1. **Prevents Rusting** . . . with a new combination of rust inhibitors . . . licks the rust problem for good.
2. **Reduces Foaming** . . . even with minor air leaks in the system.
3. **Excels in Oxidation Stability** . . . prevents sludging and emulsion formation.
4. **Prevents wear** . . . maintains tenacious film of great strength at all times.

Complete information is available—send coupon. ➡

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HYDRAULIC OILS

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or 100 Bush Street, San Francisco 6, Cal.

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☐ The Shell Cleaning Method ☐ Shell Tellus Oil

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NEW! position material securely —in SECONDS!

AMF FLOAT-LOCK SAFETY VISES extend the usefulness of your drill presses and band saws. Reduce material spoilage, prevent tool damage...*save money*. Insure fast, safe, accurate work.

FOR YOUR DRILL PRESS, Float-Lock is a full-floating vise for *all* set-ups in tool rooms and production. Locks instantly anywhere on table . . . becomes a dependable drill jig. Turns over on three sides for maximum flexibility. Eliminates time-wasting clamps, straps, bolts.

FOR YOUR BAND SAW, Float-Lock safely and securely holds all shapes and thicknesses of materials. Cutting to close tolerances made easy without hands touching material...simplifies compound angle cutting. Ideal for automatic chain-feed operation.

Order from **your industrial supply distributor** and write for illustrated folder to: Wahlstrom/Float-Lock Dept., American Machine & Foundry Company, 511 Fifth Ave., New York 17, N. Y.

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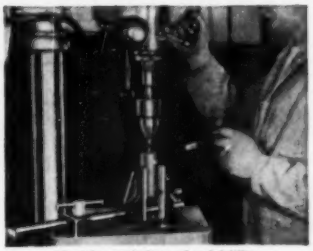
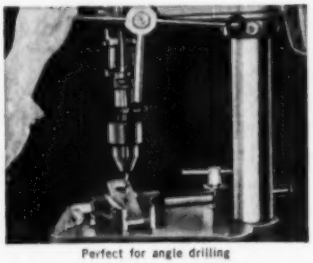
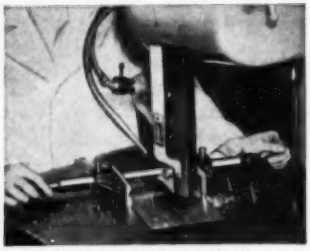
FOR DRILL PRESS ★ FOR BAND SAW



Ideal for centering and end drilling



Perfect for angle drilling



Cutting irregular shapes made easy

From the *American Machinist* Library of *Tips for Top Shop Men*

YOUR manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

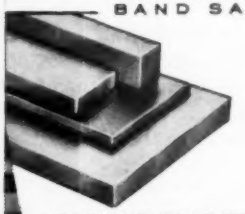
AN invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

TWO of management's most important words are "know" and "no." If you're strong on the first, you seldom hear the second.

LENOX QUALITY TOOLS

HACK SAWS

BAND SAWS



GROUND FLAT STOCK

HOLE SAWS

QUALITY LENOX TOOLS

"The Tools in the Plaid Box"

AMERICAN SAW & MFG. COMPANY
SPRINGFIELD, MASS.

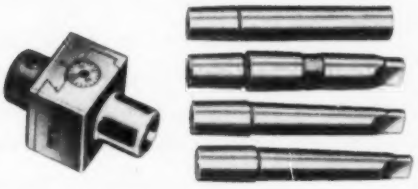
Some TAFT-PEIRCE Shortcuts to PRECISION in Production and Inspection

T-P PRECISION LEVELS

measure variations from the horizontal in calibrations of either .0003" or .0005" per foot. Supersensitive and extra-sturdy, adjustable level beam permits self-checking.

T-P BENCH CENTERS

simplify inspection work. Have unusual rigidity and permanent accuracy. This is typical of a wide range of inspection tools available at Taft-Peirce.



T-P OFFSET BORING HEAD

speeds accurate boring of light machine parts or special tools. Adjustable cross-slide has ¾" travel from center. Cross-slide screw is graduated in thousandths. Available with standard or special shanks.

T-P ANGLE BLOCK & SINE BAR SET

simplify setup and grinding of small angular work on a magnetic chuck. Angle Blocks can produce any angle from 0° to 90° by quarter degree increments. Can be used individually or in any combination to form V-Blocks.

T-P ADJUSTABLE T-PLATE

makes quick work of locating angles accurately on machine tables. Vernier scale reads within 5 minutes of angle. Available in standard size tongues for conventional T-slots. Special tongues made to order.

For the complete story on these items and many more, get your copy of the new Taft-Peirce Handbook, just off the press.

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET, RHODE ISLAND

A Proven Method of Reducing Your Tap Breakage

Excessive tap breakage means excessive production costs. That's why so many manufacturers use the precision tap sharpening method to keep tap breakage at an absolute minimum.

What is the precision tap sharpening method? Briefly, it consists of grinding each tap precisely to produce uniform spacing of its cutting edges, accurate and equal hook angles on each cutting edge, and concentric chamfers.

CLOSE-UP OF PRECISION TAP SHARPENING

Photograph shows one method of holding small tap on Blake Tap Chamfer Grinder to reduce vibration at point being ground.

THE IMPORTANCE OF PRECISION SHARPENING

Taps with uneven cutting edges are especially vulnerable to breakage. Uneven cutting edges mean errors in indexing. One land of the tap is ahead of the other, thus placing a greater share of the load on that land and causing it to cut deeper and oversize. Precision sharpening corrects these errors. A tap cutting evenly on all lands is much stronger, much less apt to break, and it cuts closer to size.

BLAKE TAP SHARPENING EQUIPMENT

The Blake Flute Grinder and Blake Tap Chamfer Grinder are the two machines which enable you to grind taps to the high degree of accuracy necessary to keep tap breakage down to a minimum.

For more information, write us for MACHINERY article, "Why Taps Should Be Sharpened Precisely" and descriptive Bulletins on both Blake machines.

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!

BLAKE CHAMFER GRINDER (Described in Bulletin 851) BLAKE FLUTE GRINDER (Described in Bulletin 651)

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

EDWARD BLAKE COMPANY 435 CHERRY ST., WEST NEWTON 65 MASSACHUSETTS

BLACK DIAMOND PRECISION DRILL GRINDERS...
WALTHAM CUTTER SHARPENERS...SURFACE FINISH STANDARDS

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

What do *you* want to know more about?

Plastics? Forging? Milling? Employee training? Materials handling? Presswork? Depreciation? Testing and Inspection?

Whatever the subject . . . if it is concerned with the production of better metalworking products at lower costs . . . you will probably find many sensible, helpful answers and suggestions in one or more of *American Machinist's* Special Editorial Reports. There is one in every issue of this magazine, and over 60 of our previous Special Reports are available now in reprint form.

Send for a list of reports currently available. Write to our Reader's Service Department at the address below.

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whether a dimension is acceptable or not when you use . . .

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The experience of designing over 25,000 Gages of every conceivable type and know-how in making them so they will tell the truth should be worth something to you.

Send for catalog or tell us your requirements and we will recommend a Gage to tell you quickly and positively what you want to know. FEDERAL PRODUCTS CORPORATION, 1127 Eddy St., Providence 1, Rhode Island.

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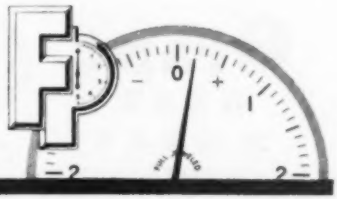
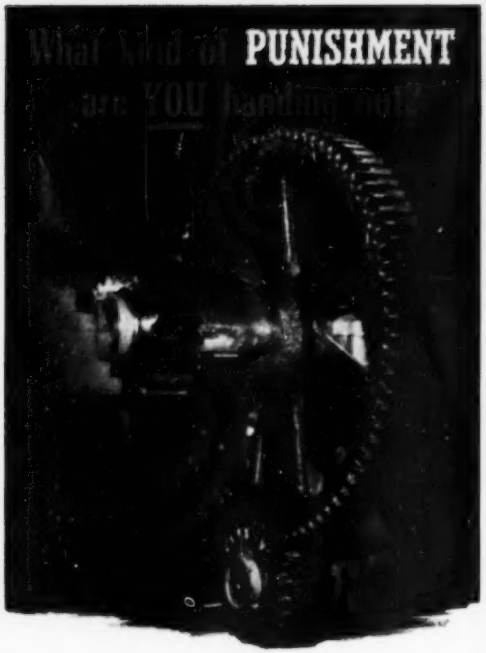




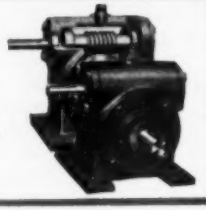
Dust? . . . dirt? . . . vibration? . . . sudden load changes? . . . 24-hour operation?

It takes a *good* gear to stand up under the tough punishment found in industry today. And Grant — thanks to over 70 years of experience — makes *only* good gears. So when you're faced with a really tough gear problem — call on Grant for a fast, economical solution.

Grant Gears are made in standard and custom types from ¼" to 72" in diameter. Hundreds carried in stock at all times. Send prints or specifications for quick quotation.

Look to Grant for *gear units*, too . . .

. . . hundreds of types and sizes available from stock — write for bulletin



Grant GEAR WORKS INC.

75th ANNIVERSARY

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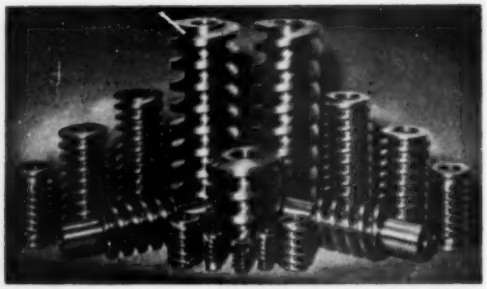


ADAMS custom made gears

While your product is still on the boards, plan on using Adams precision-made gears. Built by craftsmen . . . exactly as specified.

the ADAMS line . . .

SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	
WORMS AND WORM GEARS	SPLINED SHAFTS	GROUND THREAD WORMS
SPROCKETS	LEAD AND FEED SCREWS	RACKS

The ADAMS Compa
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

GEARS

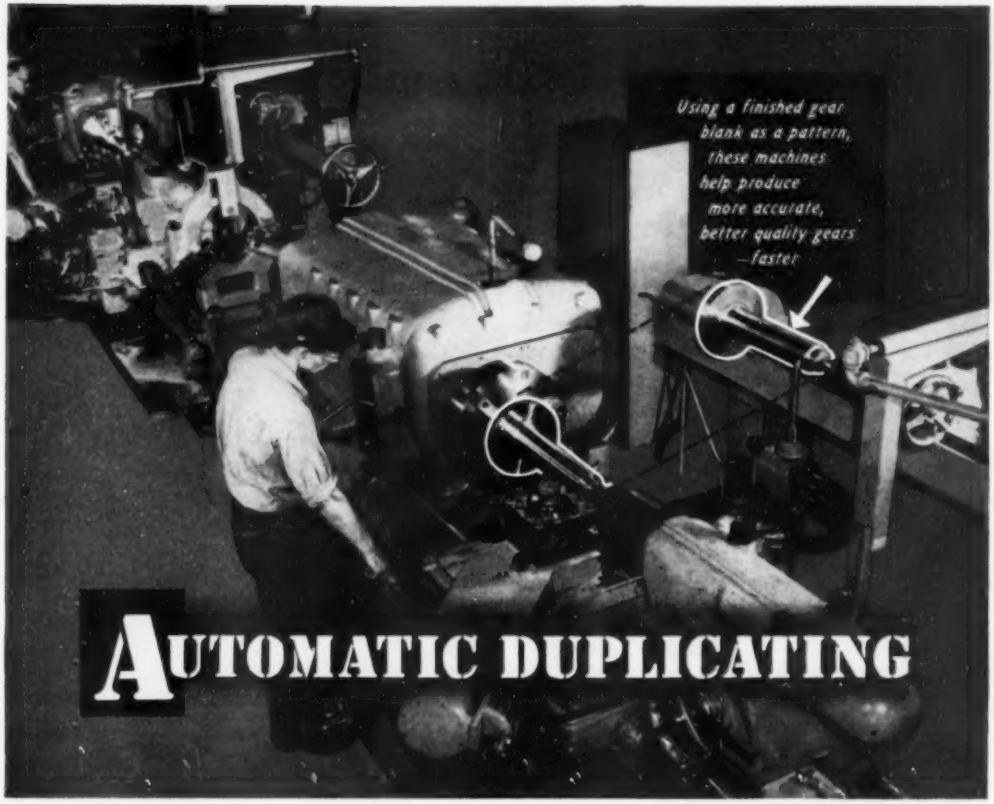
FINE GEARS MADE TO YOUR SPECIFICATIONS

GEARS
IN QUANTITY PRODUCTION

We Invite Your Inquiry

for manufacturers. A complete plant with over 100 machines in continuous production.

ACME GEAR COMPANY
5-17 47th ROAD, LONG ISLAND CITY 1, N. Y.



AUTOMATIC DUPLICATING

AUTOMATIC DUPLICATING of gear blanks in our shops, illustrated above, is faster and more accurate. And it indicates the advancements in modern gear manufacturing.

- Today quality gear manufacturing requires new machines and techniques plus experience and skill acquired making every conceivable type of gear, assembly, reducer, and transmission over a long period of time.
- It is this combination which BRAD FOOTE offers you to help solve the problems you may have. From our creation of the original drawing of the gears or assemblies you need, through every step of manufacture in our own shops, a series of controls guarantees quality. No one shares our responsibility.
- Whether your requirements call for only one standard or specially engineered gear, gearmotor, reducer, or transmission—or an unlimited quantity—you'll find BRAD FOOTE service to your liking.

Your inquiries will receive prompt attention.

BRAD FOOTE GEAR WORKS, INC.

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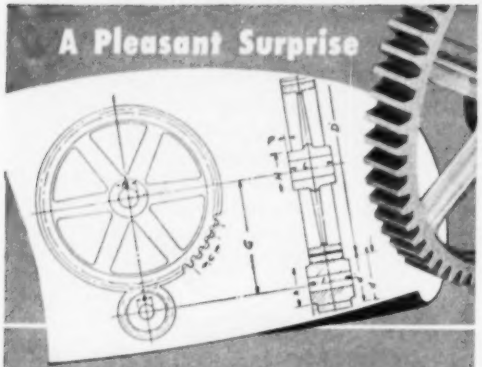
AMERICAN GEAR & MFG. CO. • Phone: Lemont 920 • Lemont, Illinois

PITTSBURGH GEAR COMPANY • Phone: ATlantic 1-9950 • Pittsburgh 22, Pennsylvania

A Pleasant Surprise



Anyone who feels that a gear is a gear has a pleasant surprise awaiting him at Earle.

Here, we've found that we've always been able to add something extra to a gear—in manufacture, performance, engineering. As a matter of fact, we've been doing this for nearly half a century—giving the *critical* customer precisely the kind of gears he wants.

Why not become one of that special group which has learned that gear value can be determined—point by point? THE EARLE GEAR & MACHINE CO., 4707 Stanton Ave., Philadelphia 44, Pa.

It's good business to do business with EARLE.

EARLE GEARS

Custom Made to work in quiet harmony through a longer lifetime.
Precision-finished to your specifications, constantly tested for accuracy and silent operation. Cincinnati Gears are made to render trouble-free service over longer time-spans.

Made for each other

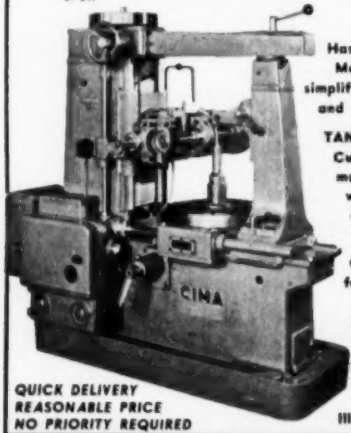
Spur | Helical | Worm | Herringbone | Internal | Coniflex Bevel | Spiral Bevel | Spline Shaft

THE CINCINNATI GEAR COMPANY
"Gears Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

CIMA UNIVERSAL GEAR HOBBING MACHINE

CAPACITY 20" DIA. 5 D. P.

SPUR | SPIRAL | WORM GEAR | WORM



Has DIFFERENTIAL Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs CLIMB CUTTING for better finish.

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The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

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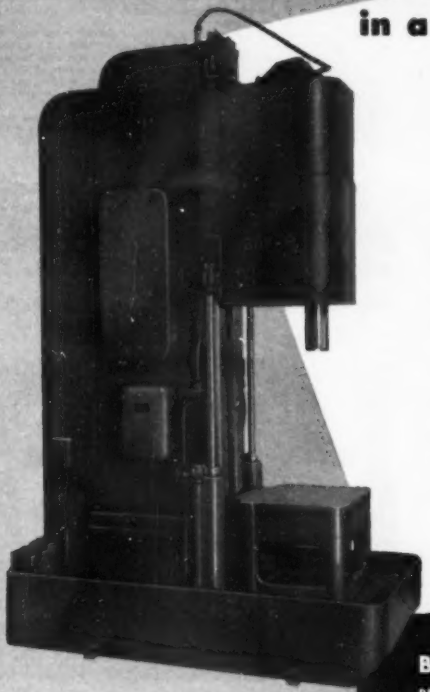
BAKER

The Versatile BAKER 36HO DRILL...

provides increased productivity in a multitude of applications!



The standard Baker 36HO Heavy Duty Vertical Hydraulic Drill may be adapted to a multitude of multiple or single spindle drilling, boring, counterboring, spot facing or reaming operations. Provision for pick-off speed changeovers gives extreme flexibility of spindle speeds. The machine is of hydraulic saddle type feed and may be furnished with either standard plain table or indexing table with up to six indexing stations. Ample capacity is provided to drive one 5 inch diameter High Speed twist drill, drilling from solid in SAE-1035 steel. Write Baker concerning your specific job problem.

BAKER BROTHERS, INC., Toledo, Ohio

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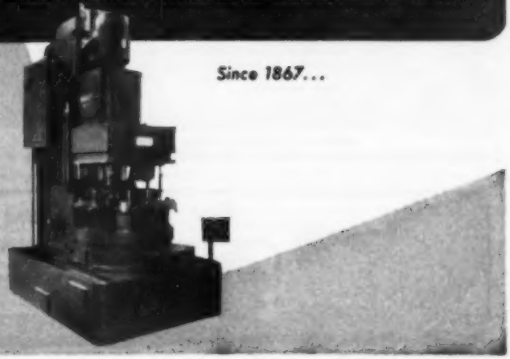
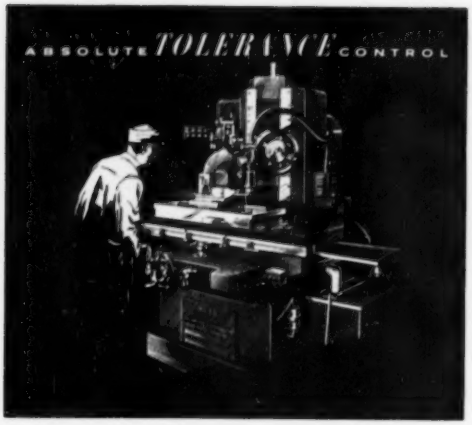
Illustrations show Baker 36HO as adapted for drilling wrench bodies for a leading manufacturer of crescent wrenches. Estimated production rate is 103 parts per hour at 100% efficiency. Machine is easily converted for operations on varying sizes of wrenches.



Since 1867...



When job specifications leave no leeway, when extreme tolerances must be rigidly maintained . . . that's when the built-in precision of Grand Rapids Grinders proves most valuable.
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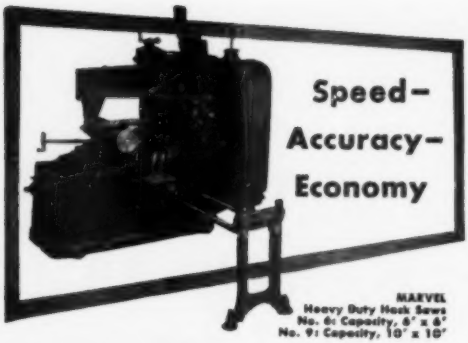

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Heavy Duty Hack Saws
No. 6: Capacity, 6" x 6"
No. 9: Capacity, 10" x 10"

The MARVEL No. 6 and No. 9 Heavy Duty Saws are ideal for production cut-off work where highest speed, greatest accuracy and true economy are essential.
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There are many more outstanding features described in our catalog. If you want the best in a hack saw—see what MARVEL has to offer.

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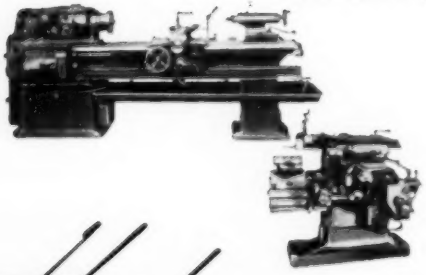
...from the plant of precision

No machine tool builder has ever surpassed Hendey's reputation for making *precision* machine tools. This reputation is based on an uncompromising standard established by the founder in 1870. This standard is exactly the same today. Only the method of achieving it has been changed—and constantly will be changed as new and better materials and techniques are developed. By concentrating all its efforts on just engine lathes and shapers, Hendey is able to provide the best thinking and the finest results in these fields. Hendey products are modern in design, are produced on modern equipment, and are as precise as modern inspection equipment will allow.



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BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
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MODERN Hendey precision engine lathes and shapers

Hole Location Practices

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 738 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

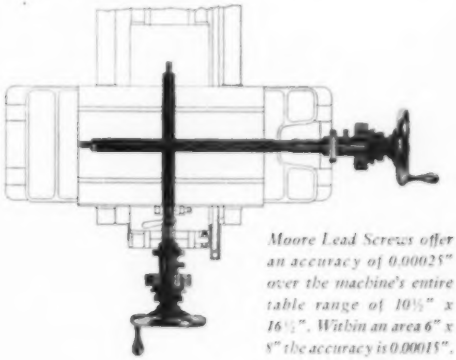
MEASURING WITH ACCURATE LEAD SCREWS

Every measuring system, whether it includes a graduated scale, end measures, or a stepped bar, depends for its accuracy on a screw. This is quite understandable, in view of the following reasons:

1. The lead screw is the only length standard capable of stepless measurement over its entire length.
2. It is the only length standard capable of translating its accuracy into both movement and location.
3. It is the only length standard which is, in itself, a complete measuring system, requiring no auxiliary equipment to make it usable.

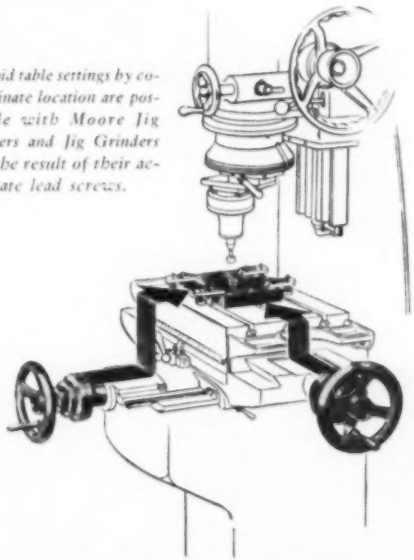
The measuring system employed in Moore Jig Borers and Moore Jig Grinders depends *only* on the accuracy of lead screws. This system has the following advantages:

1. The lead screw provides a single standard of responsibility for accuracy.
2. Elimination of additional elements cuts down unnecessary sources of error.
3. The accuracy of Moore lead screws cannot be surpassed by any other more indirect system in practical use.
4. The directness and simplicity of measurement surpass that of any other method. This is insurance against operator error, in spite of the more rapid operation possible.



Moore Lead Screws offer an accuracy of 0.00025" over the machine's entire table range of 10½" x 16½". Within an area 6" x 8" the accuracy is 0.00015".

Accurate lead screws have been installed in over 1500 Moore Jig Borers and Moore Jig Grinders. Tests made on lead screws of Moore machines, in constant use for long periods, reveal that wear on the screws is negligible for 10 years or more. Several factors contribute to this: movement of table and slide is almost frictionless, resulting in very low pressure against the threads; screws, since they are completely enclosed and lubricated through felt filtering plugs, are kept constantly clean. Screws can be checked periodically; and, if wear is found after years of use, they can be replaced at nominal costs. This could not begin to overshadow the advantages of lead screws, even if replacement were necessary more often.



Rapid table settings by co-ordinate location are possible with Moore Jig Borers and Jig Grinders as the result of their accurate lead screws.

NOW CONTOUR GRINDING ON THE JIG GRINDER

The originators of the Jig Grinder have done it again! With this completely new and larger Moore Jig Grinder, *regular and irregular contours* are ground to size and location after hardening. This extends the Jig Grinder's traditional function of relocating straight and tapered holes. The new machine also features a slot-grinding attachment and other operational advances. Write today for descriptive literature on Moore Jig Grinders and Jig Borers and their performance. Moore Special Tool Company, Inc., 734 Union Avenue, Bridgeport 7, Connecticut.

production time cut in half with SCAN-A-SCALES

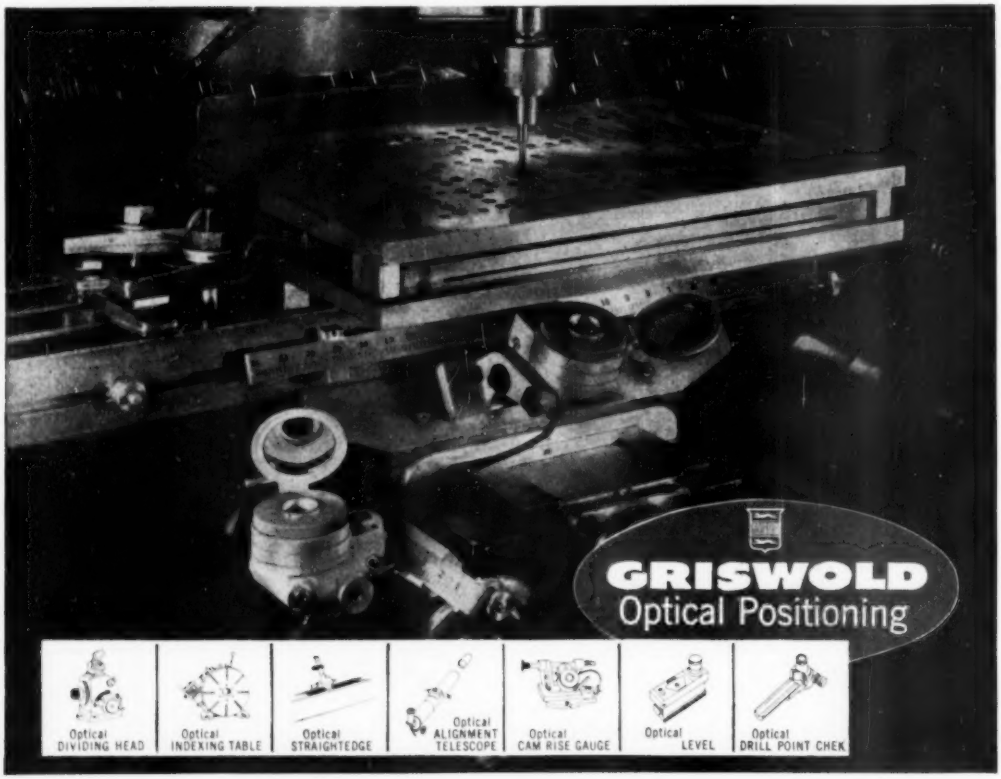
USED ON VERTICAL MILLERS, THEY PROVIDE SAME RESULTS AS A JIG BORER FOR NEW JERSEY MANUFACTURER

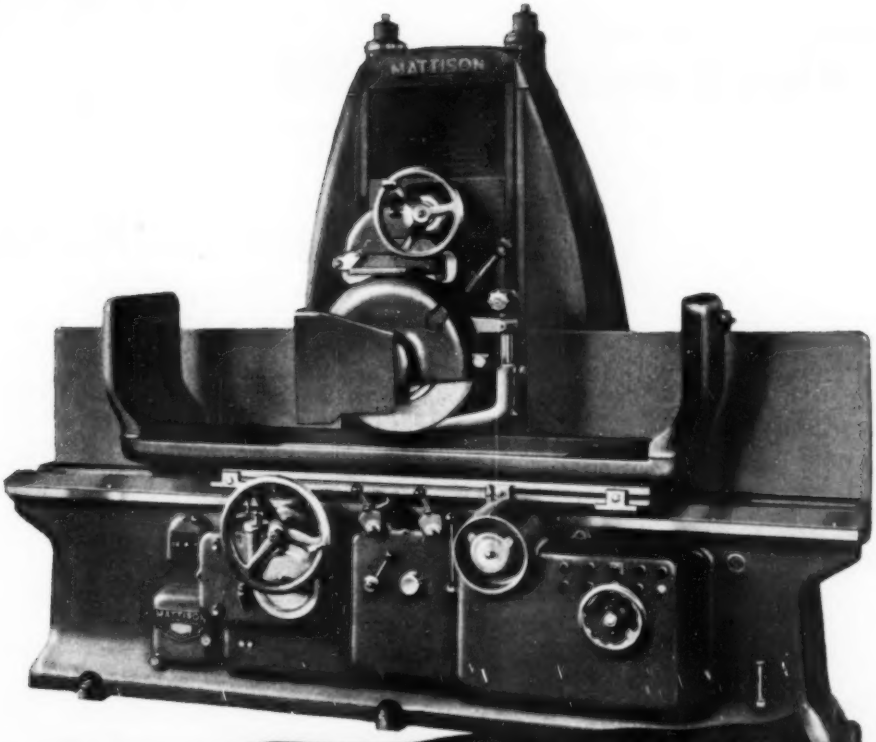
A Newark, N. J. precision tool manufacturer was using verniers, micrometers and plugs for locating 144 holes to be bored by vertical millers in a die plate. It required an hour to locate each hole and production was slow.

Scan-A-Scales, optical measuring instruments, were installed on the vertical millers and time for locating each hole was reduced to less than half-an-hour. Accuracy to within ±.0002 is now obtained and, in addition, production is speeded. The company reports it gets the same results from a vertical miller with Scan-A-Scales that it gets with a $10,000 jig borer without Scan-A-Scales.

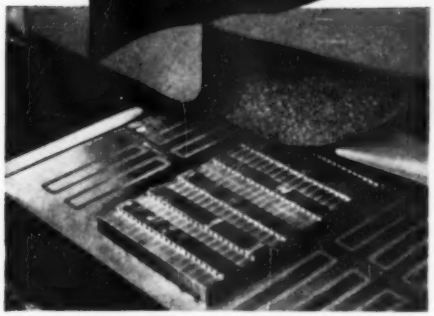
A very precise and simple method of making linear measurements on machine tools is provided by Scan-A-Scales. They eliminate the element of pressure with its variables, operators don't have to pay attention to lead screw settings and there is no backlash. They cannot be damaged by power feeds and no focusing is required.

Scan-A-Scales' optical principle offers definite advantages over other methods, providing a faster more dependable method of making measurements than length rods, vernier scales and lead screws. As a result, Scan-A-Scales soon pay for themselves in time saved. Machine tool manufacturers are now including Scan-A-Scales as original equipment and they can also be easily installed on new or old machines in your shop. Write today for your free copy of our new illustrated catalog. F. T. Griswold Mfg. Co., Wayne, Pa.





HERE'S A CHANGE THAT INCREASED PRODUCTION FROM 30 PER HOUR TO 200 PER HOUR



Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production — 30 per hour.

● Because of the greater load and grinding area of their Mattison High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example — the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder — 30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

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we have a LONG one!

He wrote, "Can you service a Niles 20-foot Boring Mill built in 1881?"

"Of course," we wrote back. With the result that this 70-year old machine tool is now hard at work turning out tank parts in Minnesota.

Which proves a point. The machines built by Niles Tool Works (and the other companies listed) were built heavier than most machine tools to give longer useful life. Thus many are still in service. But parts *do* wear out. So when this happens, remember:—we still have complete records and drawings—we still service all machines manufactured under these various corporate names.

Long-time wear like this and the long-time service we offer—are *plus* reasons for buying Niles Tools. Write: Lima-Hamilton Division, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio.

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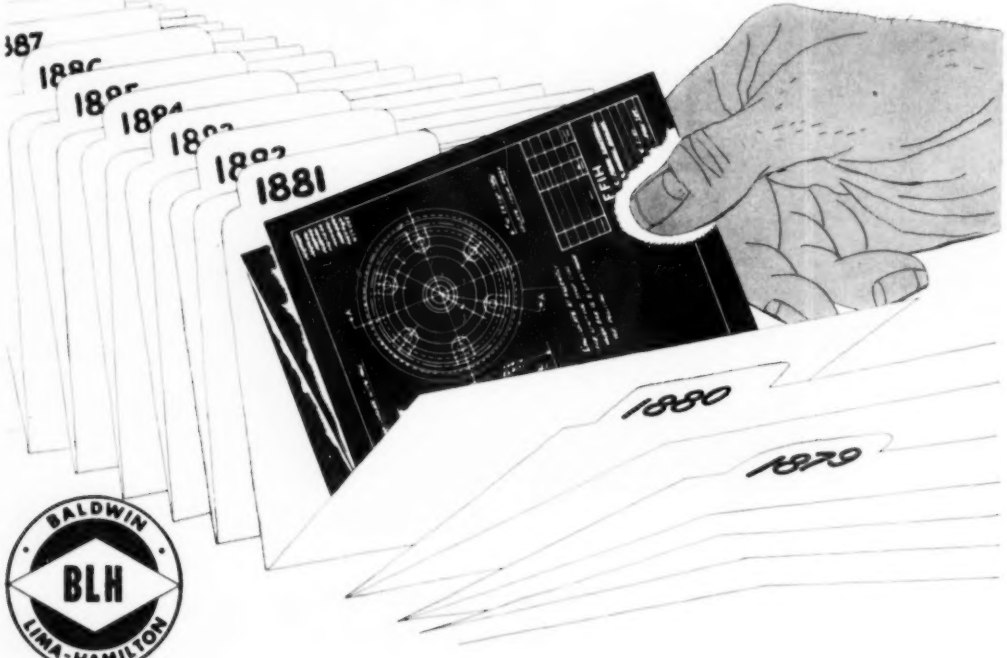
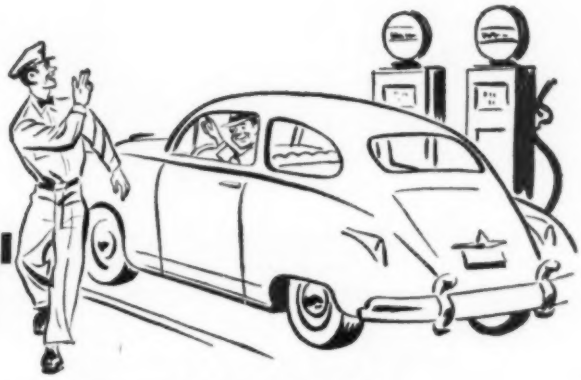


BALDWIN
BLH
LIMA-HAMILTON

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"



Nobody knows for sure how it started—this line about "See you at the Polls!" we're hearing all over these days.

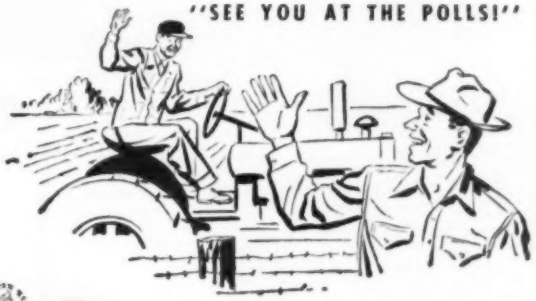
Best explanation seems to be that it came from that state candidate out west. . . . His opponent in a debate got all riled up and challenged him to fight it out in the alley.

But he said—"I'll settle this the AMERICAN way—I'll see you at the polls!" And the audience picked up the chant.

Now everybody's saying it—and on Nov. 4 everybody will be *doing* it!

"SEE YOU AT THE POLLS!"

"SEE YOU AT THE POLLS!"



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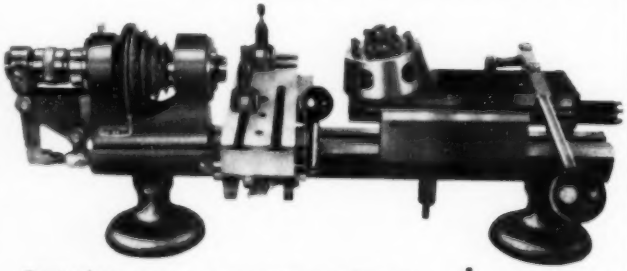

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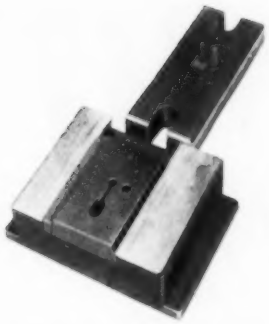
What's Ahead The Next 10 Years In Metalworking

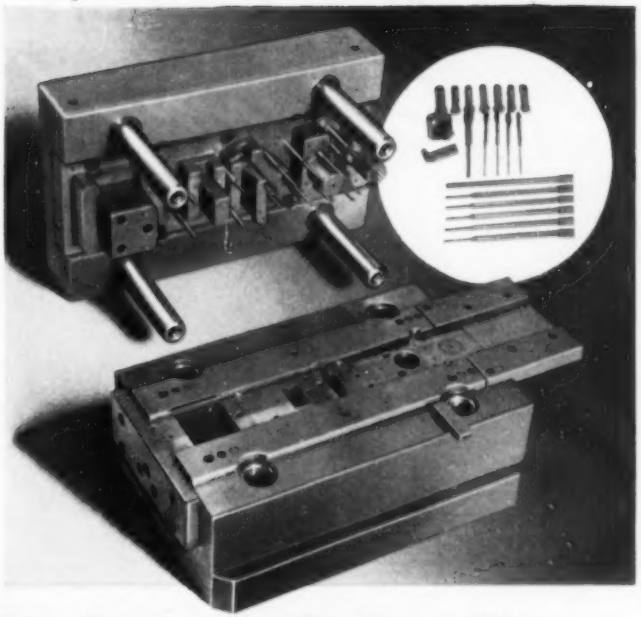
Next October's 75th Anniversary Issue of *American Machinist* will bring you more facts and new ideas on the newest metalworking production methods, equipment, and materials than you have ever had at your fingertips before.

And all of them will be of even greater value to you because this issue will also provide . . . as a broad base upon which to plan your company's production needs . . . a thorough analysis of the economic factors important to Metalworking's future growth and markets. Abundant charts, tables, and research data will give you these essential background facts in quick-reading, ready-reference form.

This far-sighted and fact-filled issue will raise to still higher levels our editorial value to you at the time we begin our second 75 years of service to metalworking production executives.

American Machinist
1877 1952





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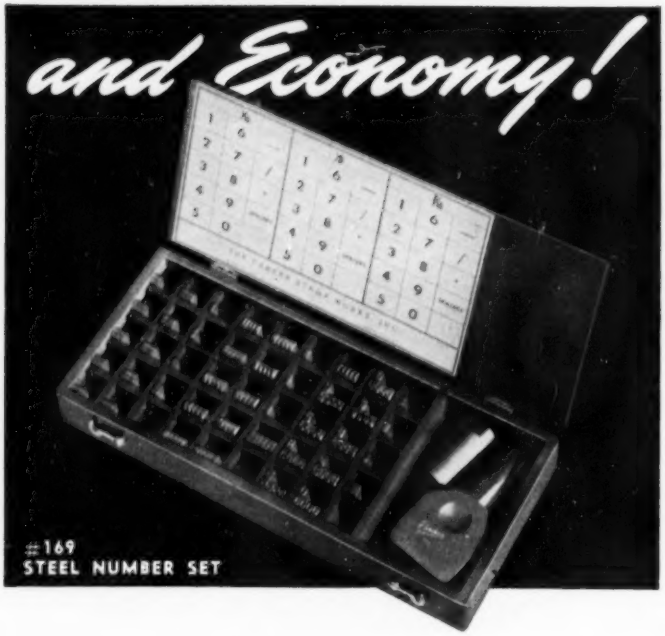

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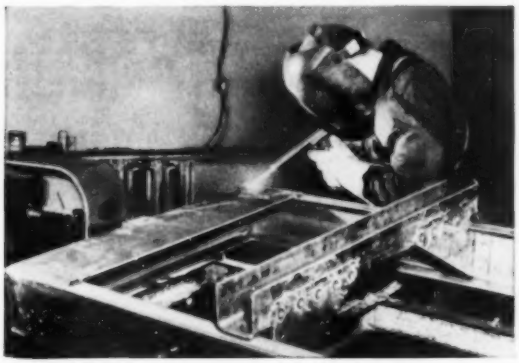
Aircomatic welding frame of Marotta Trailer. Each trailer required about 260 lineal inches of weld. Welding wire fed into the joints at 225 inches per minute permitted a new trailer to come off the line every half hour . . . eight times faster than possible with older methods.

Trailers manufactured by the Marotta Engineering Co., Boonton, N. J., for use on U. S. Air Force bases. They are used singly or in trains to move supplies rapidly for plane loadings.



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Trouble	Cause
Oversize holes.	Unequal lip length.
Drill burns—will not cut.	Insufficient clearance.
Cutting edge chips or crumbles.	Too much clearance.
Outer corners of lip break down. Excessive wear on margins.	Speed too high.
Rough holes.	Speed too slow or Feed too heavy.
Drill breakage.	
Drill point crushes.	Dirt or chips in socket or worn out socket.
Broken tangs.	

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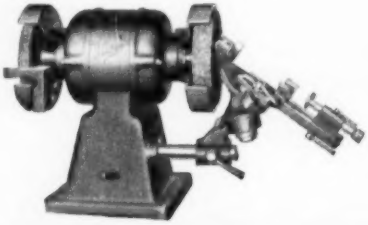
A Hisey Drill Grinder will grind drills quickly and correctly with inexperienced operators.



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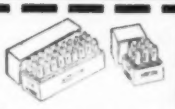

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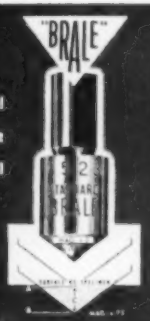

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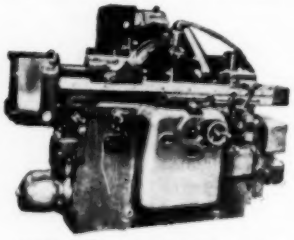

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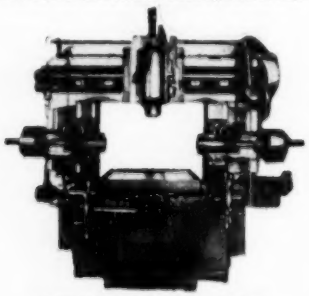

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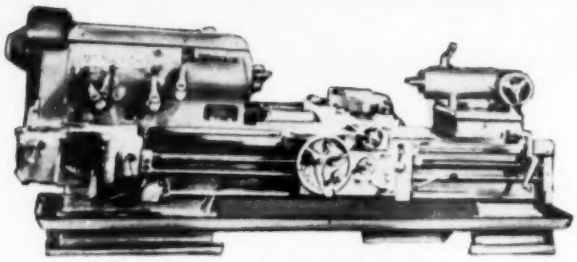

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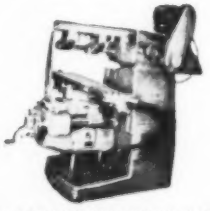

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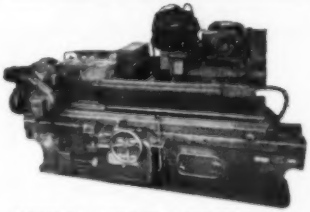

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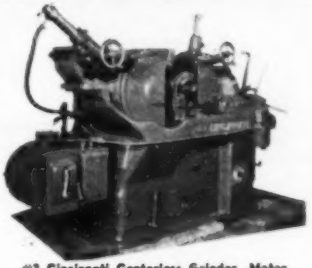
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork
MILL, #4 Burke Motor Drives, Late, M.D.
MILL, 30 H. Sundstrand Horiz. Hyd. 2 Sp. M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILL, Cinc. Horiz. #3, #4, #5 High Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-B Cinc. Vert. & Horiz. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-S, Auto. Prod.



#2 Cincinnati Centerless Grinder, Motor Drives, Thru Feed.

MILL, #0 Vernon Hand Mill, M.D. Late.
MILL, PLANER, Ingersoll 42x30x12, 4 heads.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #3 Cinc. Univ. Horiz., M.D.,
MILLING MACHINE, LeBlond #4 Horiz. Univ.
THREAD MILL, 7"x11 Hanson-Whiting, Univ., M.D.
MILLING MACHINE, Van Norman #2 Duplex, M.D.
MILLING MACHINE, K & T #3B Horiz., M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 KW.
NIBBLER, Gray Turret Type ¼"x24" cap. M.D.
OZALID Model "F" Whiteprint Machine, Late.
THREADING, Staybolt Lassiter Millhelland 1½".
THREAD MILL Gr14 Pratt & Whitney No. 1105, M.D.
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 90"x30"x12' A.C., M.D.
POWER PRESS, Bliss #184 Open Back, M.D.
POWER PRESS, Bliss #2A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #108-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70H Draka Hydraulic Arbor, New.
PRESS, #7½ Bliss S.S. 9½ Str. M.D.
PRESS, Robinson #5 O.B.I. 65 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #28, #21, OBI, A.C., M.D.
PRESS, Toledo 58½, S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 90 tons #1W.
PRESS, 60C Bliss Double Action, 2 crank.
WHEEL PRESS, Chamberlsburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #00 Whitney Deep Thr. 24", feed.
PRESS, P2, P3 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, R-41-P Wiedemann Turret, 14 stat. 24" thr.
PUNCH, Hasker Turret, 8 station, cap. 2½" Hole.
PUNCH, H & J #2 Sgle. End, 26" Thr. 1" thru 1".
PUNCH, H & J #5 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ¾" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 18"x¾" cap., M.D., Late.
ROLLS #1 Buffalo Forge Wrapping, M.D.
ROUTER, #W2600, Onsrud, Electric M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x8" Cap., M.D.
SAW, #6 Marvel Band 18"x18" cap., M.D.
SAW, #302 Campbell Abrasive Cut-off, M.D.
SAW, #20-C Racine Shear Cut 6"x9" cap. M.D.
SAW, Band, Tannewitz & GH-50" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20 "Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cincl. S.S., Motor driven.
SHAPER, Columbia 32" S.S. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, Quinkwerk #-1 Rotary 60" Throat, 10 ga.
SHEAR, #8E Niagara M.D., 8'x3/16" cap. M.D.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 50 tons, 2½" cap. M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Hasking, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OTHER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

WHY SEARCH?

WE CAN SUPPLY YOU WITH ALL YOUR MACHINE TOOL NEEDS

OVER 30 YEARS EXPERIENCE

GEAR MACHINERY

12" No. 12 Barber Colman hobbers (two)
12" No. 12H Gould & Eberhardt universal hobbers (two)
16" Cincinnati hobber
24" No. 3 Adams Farwell hobber
60" No. 5 Brown & Sharpe cutter
72" Schuchardt & Sihutte universal hobber
72" Westinghouse universal hobber
Nos. 1 & 5A Lees Bradner hobbers
No. 130 Cleveland "Rigidhobber"
4" Gleason spiral bevel generator

GRINDERS

6"x30" Cincinnati ER, in feed
10"x18" Norton semi-automatic
23", No. 228 Hanchett opposed disc
30", No. 84A Gardner opposed disc
Nos. 5, 16-28 & 24-36 Bryant internal
No. 72 Heald Gagematic & Sizematic
12", No. 22 Heald rotary surface
6"x18" Doall hydraulic surface
No. 2 Cincinnati centerless
No. 2 Brown & Sharpe universal

COMPLETE MACHINERY SERVICE

LATHES

10"x30" centers Monarch QCG, T.A.
12"x24" centers Hendey yoke head, QCG
14"x36" centers Lodge & Shipley G.H. QCG
16"x36" centers Sundstrand, QCG
24"x12', 13', & 14' Americans, G.H., QCG (3)
30"x16' LeBlond QCG
9"x14" Carbo-lathe
12" Sundstrand stub
14"x13" Fay automatic
Two Gisholt Simplimatics
Sundstrand brake drum

MILLERS

No. 2 Cincinnati plain, motorized
No. 3 LeBlond, motorized, 18 speeds, 16 Q.C. feeds
No. 3B Kearney & Trecker, 18 QC speeds, 12 Q.C. feeds
24" Cincinnati automatic duplex
30", 42", & 84" rotary continuous (Newton & Ingersoll)
48"x36"x12' Ingersoll planer type, adjustable rail
4" No. M80 Taylor & Fenn spline
8"x16" Hanson Whitney thread
4½"x12" & 6"x14" P. & W. thread
No. CT36 Lees Bradner thread

MONEY BACK GUARANTEE

PRESSES

50 ton Warco OBI, air clutch
No. 56½ Toledo straight side
No. 77½ Bliss S.S. trimming
No. 245½ Hamilton straight side
16", 88 ton Cleveland dbl. cy., hydr. clutch
Nos. 92½D, 93½C & 94½E Toledo dbl. cr.
600 ton No. 570 Toledo forging, air clutch
650 ton Hamilton forging
400 ton Ferracute EGS4 coining
650 ton, No. 8411 Hamilton double action toggle, hydr. clutch

SHAPERS & PLANERS

16" Smith & Mills shaper
24" Stockbridge shaper
24" Niles traveling head shaper
26" Smith & Mills shaper
27" Morton draw cut shaper
32" Ohio Dreadnought shaper
28"x28"x8' Gray planer
36"x36"x8' Cleveland O.S. planer
36"x36"x8' American planer
36"x36"x12' Niles B.P. planer

WRITE FOR LATEST CATALOG

MILES MACHINERY COMPANY

2025 E. GENESEE AVE. • SAGINAW, MICHIGAN

Phone Saginaw 2-3105

FINE LATE TYPE GUARANTEED TOOLS

60"x20' NILES BEMENT POND Geared Head Engine Lathe, rapid traverse

56"x18' C.M.C. Heavy Duty Lathe, 24 Speed Geared Head, power rapid traverse, 30 HP AC motor

28"x12' MONARCH Heavy Duty engine Lathe, taper attach., chucks, AC-MD

No. 3L GISHOLT Turret Lathe, 5-1/16" hole in spindle, bar feed, chucks, tooling, new 1943

No. 2B FOSTER Geared Head Turret Lathe, rapid traverse, AC motors

No. 60 NEW BRITAIN AUTOMATIC, 1" capacity, 6 spindle, rebuilt, new 1942

42" BULLARD Vertical Turret Lathe, New Era type, AC—MD

42" BULLARD Spiral Drive Vertical Turret Lathe, Serial 24000, New 1945

36" BULLARD Spiral Drive Vertical Turret Lathe, AC—MD, rebuilt

No. 1 DOUGLAS Plain Horizontal Mill, table 8"x32", power feeds, motor in base, Timken spindle, No. 40 taper, new 1942

5'-13" column CARLTON Radial Drill, AC motor on arm, 15-1500 RPM, box table

4' AMERICAN High Speed Sensitive Radial Drill, 9" column, AC motor on arm

No. 6 TOLEDO O.B.I. Press, 56 Tons

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

36" OHIO Dreadnaught Shaper, AC—MD

36"x36"x10' G.A. GRAY Maxi-Service Planer, reversing motor drive, box table, rapid traverse

1½" LANDIS Bolt Threader, leadscrews, AC—MD

75 Ton HENRY & WRIGHT Double Crank Dieing Machine, roll feed & scrap cutter

O'CONNELL MACHINERY CO.

1695 GENESEE ST. BUFFALO 11, N.Y.

NEW LATHES AT BARGAIN PRICES

New 18" x 80" Centers MEUSER LATHE and 24" x 120" Centers MEUSER LATHE. Complete with Taper Attachments, Chucks and all equipment. *GAP BED TYPE.* Available from stock all sizes up to 32" Swing. Will trade for other equipment.

WINSTON MACHINERY CO., INC.
326 W. OHIO ST. INDIANAPOLIS 2, IND.
PLaza 2408

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES

BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ⅜" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION

AMES: 1" Bench, with attachments (New)
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
Reinecker Relieving Lathe, (new)
H.E.B: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
HERBERT: #2, #4, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

PRESSES

GEN. FLEX: Screw Press, 3 ton

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
WILLIAMS: 10' Pipe & Tube Cut-Off

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Pipe & Tube, 10" Williams
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw, Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
PUNCH SHAPERS: Sentinel Shrewbury, Thiel type design (New)
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 22" (New)
GRINDER: WICKMAN Optical Profile Form Grinder (New)
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

HARVEY GOLDMAN PRESENTS

This Trade Mark Stands For:

- THE FINEST MACHINE TOOLS
- 3 GENERATIONS OF EXPERIENCE
- GUARANTEED SATISFACTION

CONSULT US WHEN YOU WANT THE BEST!

- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY

RECONDITIONED LATE TYPE
Model 601 W.D. Oster Turret Lathes
(Several)
For Bar and Chucking Work

A high speed, simplified machine capable of handling a wide variety of turret lathe work as efficiently as many more complicated and higher priced machines, and with less skilled operators.

HARVEY GOLDMAN & CO.

3900 SCHAEFER HIGHWAY ● DEARBORN, MICHIGAN
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THE FOCAL POINT FOR PRODUCTION MACHINERY

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-6 1¼" Acme-Gridley, 1943
2" Model A Cleveland, 1942
1-1/16" Model "A" Cleveland, 1933
No. RA-6 9/16" Acme Gridley, 1942

AIR COMPRESSORS
75 HP Gardner-Denver Air Compressor

DRILLS RADIAL
3'11" Archdale Radial (English), 1947

GEAR EQUIPMENT
No. 7 Gleason "Revex" Roughr. 1943
No. 6 Gleason Revacycle Generator, 1940
No. 72 Fellows H.S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, 1942
15" Red Ring External Gear Lapper, 1942
No. 7 LS Fellows Gear Lapper, 1944
Red Ring Universal Gear Checker, 1942
20DB Fellows Red Liner Gear Tester, 1942
No. 12 Gleason Tool Sharpener, 1943

GRINDERS CYLINDRICAL
14"x168" Norton Plain Type "C", 1942
16-20x36" Norton Plain Type "C", 1942
14"x48" Landis Plain Type "C", 1943
12"x96" Fitchburg Plain Hyd. 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS INTERNAL
No. 72A3 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1945
No. 16 CP 16 Bryant Hydraulic, 1942
No. 16-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic, Gap, 1940
No. 4 Bryant Internal, 1940

GRINDERS RADIUS
No. 73 Van Norman Radius Grinder, 1942

GRINDERS SURFACE
No. 22 Heald Rotary 22" Chuck, 1944

GRINDERS THREAD
No. 10A Excello Internal Thread Grinder, 1943
No. 11 Excello Precision Thread Grinder, 1942

GUN BARREL MACHINES
No. ½Bs30 Pratt & Whitney Rifler, 1942
No. ½Bs30 Pratt & Whitney Reamer, 1942
No. ½Bs30 Pratt & Whitney Reamer, 1942

HAMMERS
No. 2B Nazel Forging Hammer, 1942
200 lb. Bradley Helve Hammer, 1942

LATHES ENGINE
56"x29" American Geared Head, M.D.
25"x120" Oldfield Schofield, New
24"x120" Lodge & Shipley Cone.
14"x30" Bradford, 1942

LATHES PRODUCTION
No. 3FU Foster "Fastermatic" Platen Type, 1942
No. 5D Potter & Johnston Automatic, 1943
No. 4D Potter & Johnston Automatic, 1942
6"x84" Lo-Swing Semi-Auto.
Lipe-Carbo-Matic Lathe, 1942

LATHES TURRET
24" Bullard Vertical, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. 4R Gisholt Universal Saddle Type, 1943
No. H5 Libby Universal Saddle Type, 1938
No. 5W Acme Universal Way Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942
No. 4 Gisholt Simplified, 1941
No. 1 Warner & Swasey Electric Head, 1940

MILLS TOOL ROOM
No. 4B Milwaukee Plain, M.D.
No. 5 Cincinnati Vertical, M.D.
No. 2G Kempsmith Universal, 1947
No. 2 Kempsmith Vertical Maximiller.
ALS Alcera Plain Mill (No. 2 Size), New
No. 2 Rapid Universal Mill, New
FPN 2B Mathey Vert. Mill, New

MISCELLANEOUS
No. 50A Quickwork Rotary Shear, 1943
2000 HP Midwest Dynamometer, 1942

PLANERS AND SHAPERS
52"x36"x40" Cincinnati Planer.
26" Ariston Shaper, New
24" Invicta Shaper, New
21" Ariston Shaper, New
20" Smith & Mills Crank Shaper, 1942
18" Invicta Shaper, New

PRESSES
650 Ton Verson Double Action Eccentric, 1940

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

POWER PRESSES —HYDRAULIC

500 Ton Woods, 4 Column 7½" diam. Stroke 24", Daylight 48". Bed area 8' x 6' bet. columns. Diam. of Ram 23". 2 Pull backs 20½. Pump and motor.

350 Ton Southwark. 4 columns, 7" diam. Stroke 24", Daylight 76". Bed area 8' x 5' overall. Diam. of Ram 38". Air Cushion 60" x 56½". Less Pump and Motor.

Photos and details upon request

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N. Y.
Dept. "A" Phone: Triangle 5-5237

GRINDERS: Heald No. 73 Internal Centerless, S/N 17099. Heald No. 74 Internal Centerless S/N 24602. These two grinders are in excellent condition and are equal to new. Cinn. 1½ Cutter Grinder S/N A-612T w/extra attach's.

COLD HEADERS: No. 3 Waterbury Farrel Triple Stroke Open Die Toggle Header, S/N 23508. 3/16" Asa S. Cook Single Stroke Open Die Crank Header: 5/16" Asa S. Cook Single Stroke Open Die Crank Header, S/N 365.

THREAD ROLLERS: No. 20 Waterbury Farrel Horizontal Hand Feed S/N 215: ⅝" cap. Nat'l. Hyd. Hor. Hand Feed, 22 sets New Thread Roll Dies, Std. Sizes, 1944.

ED SMITH MACHINERY SALES
1529 Lillibridge Detroit 14, Mich.
VA 2-4830

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 32, 3" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vert.
New 3" Hor. Bor. Mills

DRILLS AND RADIALS

American 6'x15" Univ.
Bausch Multi-spindle
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x15" cal.
Natco #12 20 spindle drill, Bausch
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" cap.
Leland Gifford 2 LMS 3 MS

ENGRAVERS

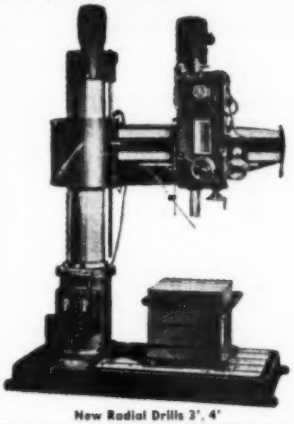
Deckel type 3 Dim., New
Gorton 3S Die Sinker
Gorton #1A, ME, Deckel G1L
Taylor-Hobson 3 dim.

GEAR EQUIPMENT

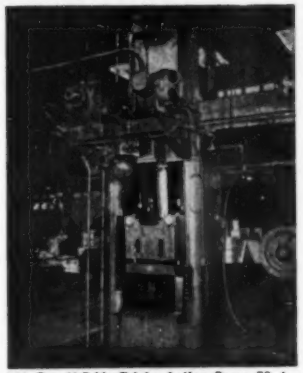
Barber-Colman #2, #12 (3), Flather 72" Cutter
Fellows High Speed Shapers 712, 725, 71
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24-A
National Broach Red Ring Lapper
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

Bryant #5, Internal, chucking, 16A16
Cincinnati 6x18" Cyl. Hyd.
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.



New Radial Drills 3', 4'



150 Ton H.P.M. Triple Action Press 50 ton cushion, 50 ton blankholder, bed 36" x 36".

Kempsmith #1 Pl.,Vert. & Div. Hd.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

GRINDERS, SURFACE

New 8x24" Hyd. Feed
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Gallmeyer & Liv. #55, 8x24 Perm.
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd., 10x36" Hydr.
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base
Taft Pierce #1 Precision

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Hendey 12"x42" and 12x30", 1941, 14x66"
Hendey 14" Toke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Corbo 12"x18" (2)
Late, P. & W. 16"x60
Lodge & Shipley #3A, #3 Duomatics
Sebastian 12"x4' G.H., Sheldon 12"
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sheldon Lathes & Turrets, Like New
Sundstrand 8x15", 15" Stub
Rivett Model 918 Precision
New 16, 18, 20", 28" Immediate Del.

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2

Archdale Plain, 14", Prod.
Brown & Sharpe #38 Plain, Late, 3A, 21, #2L
Cinn. No. 3, 4 Plain Spd.
Hardinge Mod BB4, Kent Owens 1V, 1-8, 1-14, 1M
Milwaukee 2K, 2H Univ., 2H Plain
Milwaukee #28, Plain & Univ.
Simmons Micro-Mill #1A
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ.

MILLS, VERTICAL

Brand New Vertical Mills

Brown & Sharpe #3 single pulley drive
Cincinnati #3, #4 hi-power
Cincinnati 08 Vertical
Jackson, Reed Prentice
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
Bliss 5-48 Dbl. 32x48" bed, Cushion
Toledo 92½c Dbl. Crank 43x23" bed
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3

TURRET LATHES

Acme 6W Fax 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic
Jones & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, 3, #4 Preselector

MISCELLANEOUS

Automatic; New Britain 61 6 Sp. 1¾" Late
Automatic, Cleveland Model B 1-1/16", A
Automatic B & S #00G, 0G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36", 16" Metalmaster
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Broach: 3L LaPointe Hydro. Horiz. New Klink. 6 Ton
Hacksaw: Peerless 6"x6"
Honer: Micromatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt, Cinn. 20, 24"
Shears Power: George Ohl 10' 3/16", 10' x 16 gauge, 11' 16 gauge
Welder: 50 KVA Eisler Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave

New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

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Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shaper 7" Amco, 8' Shaperite — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes Motors, Grinders, Buffers.

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150 Ton Triple Action HPM Press
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24" Cincinnati-Bickford, m.d.
25" Wright, belt drive, tapper
26" Aurora, m.d., tapper
26" Barnes All Geared Self-Oiling, m.d.
12" Aurora, belt drive
DA Colburn, m.d., H.D.
No. 114 Baker, m.d.
No. 315 Baker Heavy Duty, s.p.d.
32" Superior Drill

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No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows, Gear Finishing Machine, m.d.
No. 6 Fellows, belted m.d.
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No. 6AS Fellows, m.d.
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No. 6AA Fellows, m.d., latest
No. 6AS Fellows, belt
No. 72 Fellows, m.d., latest
No. 75 Fellows, m.d.

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6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical
No. 2MS Lees-Bradner Spur & Helical, m.d.
No. 11LS Fellows Gear Lapper, m.d.
96 11 Gear Grinding Machine, m.d., latest

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No. 12 Barber-Colman, single overarm, m.d.
No. 12 Barber-Colman, double overarm, m.d.
No. 14 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d., Spur & Spiral

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No. 50 Cross Universal Gear Chamfering Machine, m.d.
Gleason Spiral Bevel Gear Roughor, m.d.
5" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
National Broach & Machine Co. Red Ring Gear Speeder, 10"

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No. 1 Brown & Sharpe Spur Gear Tester
12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.

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Kwik-Way Model H. Piston Turning & Grinding Machine, m.d., late
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

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No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap ⅝" valve stems, m.d.

PLAIN CYLINDRICAL GRINDERS

6x18" Landis Plain Self-Contained, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x18" Cincinnati Hydraulic, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x24" Landis Plain Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x48" Modern, belted, m.d.
12x90" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
10x52" Norton, motorized
No. 2B—10x18" Brown & Sharpe, m.d., late
No. 2 Gardner, belted m.d.

DISC GRINDERS

No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 20 Gardner Comb. Disc Grinder and Roll Sander, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
No. 24—63" Gardner, m.d.
#124 Gardner Horiz. Grinder, m.d.

EMERY GRINDERS

3 H.P. Baldor Pedestal Type, 32M
5 H.P. U.S. Electrical Tool Co. Model 95
#516 Mummert & Dixon Radial Emery Grinder, m.d., 5 H.P. motor
Hammond Model 4 Carbide Grinder

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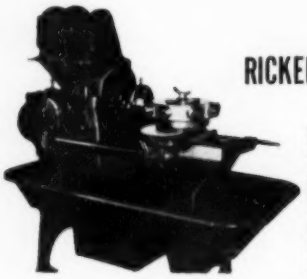

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Cast Iron Electric Connectors. Adjustable ring for tripping die head, giving the operator positive control over the length of thread cut.

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BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

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CINCINNATI 60"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

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GYROMATIC Model 40 15/8" 6 spindle Late.
CLEVELAND 3¾ Model A; Late Type.

BORING MILLS—Horizontal
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS #95 floor type; 3½" bar; M.D.
NILES 8" bar floor type, motor drive.

BORING MILLS—Vertical
BETTS 120" 2 heads P.R.T.; M.D.
BULLARD 8", 16" 6-spindle "A" Mult-au-matic
COLBURN 72", 2 heads PRT. M.D.
NILES 100", 2 swivel heads; motor drive
NILES 53", 2 swivel heads, motor drive.

BRAKES & SHEARS
BESCO 14 gauge 60" Press Brake; NEW.
BESCO 14 gauge 72" Press Brake; NEW.
BESCO 36", 16 gauge Foot Shear; NEW.
BESCO 36", 20 gauge Power Sq. Shear; NEW.
BESCO 48", ⅛" gauge Power Sq. Shear; NEW.
BESCO 48", 16 gauge Power Sq. Shear; NEW.
BESCO 48", 14 gauge Power Sq. Shear; NEW.
BESCO 72", 14 gauge Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
CHAMBERSBURG 500 HP, Billet Breaker; late type.
JAMES RENNIE No. 8, Univ. Ironworker; late type.
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QUICKWORK No. 6, 1" capacity; motor drive.
WORMSER T-15; Univ. Ironworker; NEW.
WORMSER T-25; Univ. Ironworker

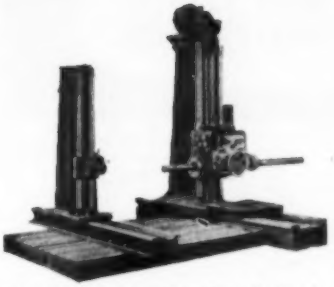
BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
COLONIAL V.G. 1-10-48; Vert. Hydr. late.

DRILLS—Radial
CINCINNATI BICKFORD 6' arm, 15" col.; M.D.
CINCINNATI BICKFORD 6'15" Univ.; M.D.

DRILLS—Miscellaneous
AVEY No. 2, Ball bearing, Motor drive.
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back, Late
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.
FOOTE-BURT, 6 spindle, late type.
LeBLOND No. 2, deep hole, late type.
LEMAIRE, 5 spindle, late type.
MOLINE 6-spindle Hole-Hog 3¾"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6"& 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Rounders; M.D.
DETROIT type GG-35 Gear Grinder; late type.
FELLOWS No. 4 Envoloning Gear Gen., M.D.
FELLOWS Nos. 61A, 6Z2, 7S, 7A, 72, 77 High Speed Gear Shapers; late
FELLOWS 18-L8 Lapper; late
GLEASON #20 Tester Late Type
GLEASON 25" straight dbl. gear gen.; M.D.
GLEASON #18 bevel cutter-grdr. M.D. late type
GLEASON 18" hev. gear Tester & Lapper; M.D.
GLEASON #6 Revacycle. Late type.
GLEASON No. 12 Tool Sharpener; late
GLEASON 12" Straight Bevel Gen.; late
GLEASON #4 & #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear gen.
GLEASON 24", 27", 27", 96" Bev. Gear Planer
GLEASON No. 14 Hypoid Grinder; late
MICHIGAN Gear Finisher, Model 962-24-A, 24" cap. Late Type.
PRATT & WHITNEY 10" Gear Grinder; late

GEAR HOBBERS
BARBER COLMAN Type A; Late.
BARBER COLMAN #12 Motor Drive
GOULD & EBERHARDT #18H, Motor Drive.
GOULD & EBERHARDT #36 H; Late
GOULD & EBERHARDT #36HM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late
PFAUTER RS1; Max. dia. 30" late



LANDIS #40, 4" bar, Floor Type, Horizontal Boring, Milling and Drilling Machine.

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x72 Model EM Plain, Late
LANDIS 16x36" Type C Plain, Hydr. Late type.
LANDIS 10x18" Type C Plain, Hydr. Late type.
LANDIS 10x18" Type C; late type
LANDIS 4"x12" Type H, Plain; Late.
LANDIS 30" x 240" Plain cyl., M.D.
NORTON 10x72; type C; plain; M.D.
NORTON 16x120; plain; M.D.
NORTON 14x30" plain; late.

GRINDERS—Surface
ARTER 8" Rotary, M.D.
BILLITTER & KLUNZ 48"x196" Way Grinder
HEALD #22 Rotary, 12" chuck; m.d. Late
PRATT & WHITNEY 14x56" Model B, Late
THOMPSON 2V Special; late type.

GRINDERS—Misc.
BRYANT No. 3 Internal; hydraulic; late
BRYANT No. 5 Internal; hydraulic; late
BRYANT No. 16-C-16 Internal; hydraulic; late
BRYANT No. 16-CP-16 Internal; hydraulic; late
BRYANT No. 24 Internal; hydraulic; late.
EXCELLO #48 Carbide Late
HEALD 75A, special internal; late type.
HEALD No. 72-A-8 "Gagematic" Int.; Late
HEALD No. 72-A-8 "Gagematic" Int.; Late
HEALD 72-A-3, 72-A-5 Plain; motor drive
HEALD No. 78 Internal Centerless; M.D.
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

HEADS AND UPSETTERS
ACME 2" Model XN, late type
AJAX 8¼" Upsetter, motor drive
MANVILLE #3 DSOD, Motor Drive,
MANVILLE #2 DSOD, Motor Drive.
MANVILLE #1A, DSSD, Motor Drive
WATERBURY FARREL #11, DSSD, M.D.

LATHES—Engine & Mfg.
AMERICAN 86"x88" centers geared heavy
DENHAM 16x48" centers, Gap; late type
DENHAM 12x54" centers, Gap; late type
DENHAM 16x72" centers, Gap; late type
GRAHAM NORMANTON 12"x48" centers; late.
HENDEY 12"x54" centers, belted motor drive.
JONES & LAMSON "FAY" 20x36" Auto. Late
LEHMANN 16"x30" Hydratrol; late type.
LEHMANN 25x96" center; Timken; grd. M.D.
LeBLOND 16x36" center; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 14"x30" Centers, late type.
LODGE & SHIPLEY 16"x30" Centers, late type.
LODGE & SHIPLEY 24"x96" centers; Late
LODGE & SHIPLEY No. 8—24" and 96" centers DUOMATIC Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 14"x42" type Z, Magnamatic; late
NILES 30"x46', 40"x50' Boring; "Time-Saver"; Timken; Late
PORTER-McLEOD 16" x 6'; NEW.
PORTER-McLEOD 16" x 8'; NEW.
PRATT & WHITNEY 16"x30", Timken; late
REED #6WS4, 12x18" Mfg.; Late type.
REED-PRENTICE 14"x54", Timken; late type.
SPRINGFIELD 16"x30" Centers, Timken; late
SPRINGFIELD 14'x43", geared; M.D.
SUNDSTRAND 10x60" Auto. Late Type
SWIFT 16"x72" Centers, M.D. Late
SWIFT 20"x120" centers; late.

LATHES—TURRET
MOREY No. 2 ram type TIMKEN
GISHOLT 11, Saddle type, M.D. Late
MAGDENBERG Model MWF-BG-250 Univ. table type; P.R.T.; 12" hole through spindle; cross sliding turret; M.D.; Late
WARNER & SWASEY 4-A, Timken Bearing. 7⅛" Bore, motor drive.

MILLING MACHINES—Pl. & Univ.
BROWN & SHARPE #2B Timken; M.D.
CINCINNATI #2 Plain, hi power Timken; M.D.
KEMPSMITH #2 Timken; Univ. M.D.
CINCINNATI 4-4S, 4 spindle, Tracer; Late
KEARNEY & TRECKER #2-K Vertical; Late type.
ROCKFORD Rigid-Mill #3 M.D.
STARR No. 2, table 13"x55"; late.
RICHMOND #2, light, late type.

MILLING MACHINES—Mfg.
GOULD & EBERHARDT 26 Cont. type; M.D.
INGERSOLL 52x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
SUNDSTRAND Mod. 3A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type
LEES BRADNER HT 12"x54", M.D.; Late
LEES BRADNER HT 12x36" M.D.; Late
MOREY 12x30" centers, 12x120" centers, late
PRATT & WHITNEY 4½x12 Mod. C; late

PLANERS
BETTS CONSOLIDATED 108" x 84" x 44' 6 heads; PRT; Box Table; M.D.
GRAY 24x24x6'; motor drive.
GRAY 16"x36"x10', 4 heads PRT. Late.
LIBERTY 144"x76"x48" adj. variable, openside, box table; 4 heads, PRT; M.D.
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
NILES-BEMENT-POND 60" x 60" x 12' Rapid Traverse, 2 swivel heads, box table, M.D.

SAWS
CAMPBELL #401 Abrasive cut-off. Late.
ESPEN LUCAS No. 670 30' cap Hydr.; Late.
GROB OS-20 metal band saw & filer; late.
HELLER Model SS-1, 6¾ Cap Cold Saw.

SHAPERS—SLOTTERS
DILL 18" Slotter; motor drive.
PRATT & WHITNEY 6" Vertical; M.D.
PRATT & WHITNEY M 1251 10" Vert., M.D.
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late Type.
ROCKFORD 24" Hydraulic; late type

PRESSES
BESCO EB 2 Power Punching; NEW
BESCO EB 3 back flywheel; NEW
BESCO B-4; back flywheel; NEW.
BESCO No. 18, 10-ton OBI; NEW.
BESCO Mod. 21 incl. 40 ton, 3" stroke NEW
BIRDSBORO 325 ton Vert. Hydr; Late
BLISS #6 SS DC 135 ton; 34"x95" bed; 2½" stroke; 60 SPM.
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
BLISS No. 3½A geared toggle; dble. acting
GLEASON 15" Quenching; hydr.; M.D.
HANNIFIN 6-ton, 14-inc; hydr. Late.
HANNIFIN 16-ton Hydraulic; late type.
NATIONAL #5 H.S. Maxi-Press (Forging)
SENTINEL 25-ton OBI; NEW.
SHORE, 400 ton Hydr. Flanging & Forcing
TOLEDO #98 Straight Side DC 113 ton; 33"x 104" bed; 2" stroke; 70 SPM.
WATERBURY FARREL 125 Ton; St. Side

MISCELLANEOUS
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
BAUSH #1 Radial tapper; late type.
CROSS #45 Tooth Gear Chamfering Machine
FISCHER No. 1, Oil Groover; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
HUGH SMITH 1"x24'6" Plate bend. rolls M.D.
LeBLOND No. 2 Barrel Rifling Machine.
MANVILLE #2C Screw Slotter; Motor Drive.
MANVILLE #1 Screw Slotter; Motor Drive.
LANDIS 2" Dble. Spdle. Threaders; M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 3C Thread Roller; M.D.
SAUNDERS 8-18" Pipe Machine; M.D.
US TOOL #10-B Cutter Reliever; Late
WATERBURY FARREL No. 11 Thread Roller
WEYBRIDGE Slitter; 36x22 gauge; NEW

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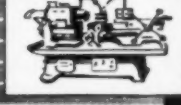

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PARTIAL LIST OF LATHES

American 30"x14' American G.H. Lathe, complete with taper attachment.
Monarch 24"x12' G.H. Lathe, complete with taper attachment.
American 20"x40' bed, Internal Face Plate Drive, 53" centers, 2⅝" hole in spindle.
American 20"x14' bed G.H., 12 spindle speed, taper attachment.
American 24" x 12' bed 3 SCD, motorized.
Lodge & Shipley 19" x 120" centers G.H., Timken bearing, drop lever handles in apron, late type.
Bradford 20"x10' bed, 4 SCD, 12' centers
Lodge & Shipley 20"x8' bed, single pulley
Boye & Emmes 18"x8', 3 SCD, motorized
Lodge & Shipley 18"x6', single pulley
LeBlond 17"x8' bed, 5 SCD
Monarch 16"x8' bed, 3 SCD, motorized
American 16"x8' bed, 3 SCD, bowl head
Lodge & Shipley 16"x6', single pulley
LeBlond 15"x8' G.H., 9 spindle speeds
Lodge & Shipley 14"x6', 3 SCD
American 14"x6', 3 SCD bowl head
American 30"x12', 3 SCD Lathe, 8' centers.
LeBlond 27"x10', 3 SCD Lathe, 5'11" centers.
American 24"x10' Lathe, vee-belt drive, 13' centers, 12 spindle speeds.
Boye & Emmes 20"x10', G.H., complete with taper attachment.

BORING MILLS—Vertical

Niles 36"-44", 1 rail and 1 side head.
Niles 42"-90" Driving Box Borer, Burnisher and Facer, motor driven, late type.
King 42", motorized, 2 heads on rail

GEAR MACHINERY

Gould & Eberhardt 96H Gear Hobber
Gould & Eberhardt 90BM Gear Rougher
Gould & Eberhardt 36H Hobber
Fellows 8½ Spur Gear Shaper
Fellows 72S Gear Shaper, with spur guide
Brown & Sharpe 4-48 Gear Cutter
Brown & Sharpe 3-25 Gear Cutter

GRINDERS—Cutter & Tool

Oliver Template Tool Bit Grinder, late.
Sellers 4T Tool Grinder, late type
Sellers 6T Tool Grinder, late type

GRINDERS—Internal

Heald 78 Centerless, Internal & Cylindrical, late type
Heald #50, tight & loose pulley
Heald #78A, new 1941
Landis 26"x108" Plain Cylindrical Grinder, motorized with motors.
Cincinnati #3 Universal Grinder, 12"x48" capacity, belt drive.

GRINDERS—Cylindrical

Landis 10x18 Type C Plain, late type
Cincinnati 10x96 Plain Cylindrical, swings 35" in gap
Landis 10"x72" Plain Cylindrical

GRINDERS—Thread

Jones & Lamson 8x31, late type

MILLERS—Plain

Brown & Sharpe #3, 4 SCD
Cincinnati #3 Dial Type Miller, motor in base.
LeBlond 3H Plain Miller, 3 SCD.

MILLERS—Universal

LeBlond 2½ Heavy Duty, 3 SCD, motorized

DRILLS — Radial

Cincinnati-Bickford 5'13" Radial Drill.
Fosdick 6'15" Heavy Duty Radial Drill.

PLANERS

Cincinnati 24x24x6' Double Housing
Liberty 36x36x18 Double Housing
Niles 48"x48"x16' Double Housing, 4 heads, box table, DC reversible drive.
Niles 84"x84"x18' Double Housing, 4 heads, box table, DC reversible drive.
Bement-Niles 10'x10'x20' Double Housing, 2 rail and 2 side heads, with all electrical equipment.

SHAPERS

Smith & Mills 14" Plain Crank, Lima drive
Gould & Eberhardt 16" B.G., gear box
Barker 18" B.G., 4 SCD
Averbeck 21" B.G., 4 SCD
Cincinnati 24" B.G., 4 SCD
Gould & Eberhardt 24" B.G., gear box
Smith & Mills 25" B.G., 4 SCD
Columbia 28" B.G., gear box drive
Gould & Eberhardt 28" B.G., gear box
Gould & Eberhardt 32" B.G., gear box
Smith & Mills 32" B.G., gear box drive

ROLLS

Bertsch 8"x⅝" Initial Type, Ac variable speed motor drive.

MISCELLANEOUS MACHINERY

H&G Model I-K Threading Machine, late
Taft Pierce Bench Center, 3"x48" centers
Hoffman Heavy Duty Portable Cleaner
Model #22 Rodgers Hand Track Press

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BORING MILLS

Dotrick & Harvey #2 Floor Type Horizontal—5" bar—60" vertical and 72" horizontal travel—universal table—MD
Bullard 42" and 54" "Spiral Drive" Vertical—4-jaw chuck tables—side heads—MD
Niles 53" Vertical—42" under cross rail—36" under tool holders—MD
Betts 8' Vertical—Actual swing 108"—69" under cross rail—MD
Cincinnati 10' Vertical—Massive type—actual swing 126"—MD

DRILLS, RADIAL

Fosdick 3'14"—Tumbler gear box—box table—18 spindle speeds—MD
Cincinnati-Bickford 7'22" "Master" type—box table—straight base—24 spindle speeds—MD

GRINDERS

Norton 10" x 18" Type "C" Plain Mechanical—center grinding attachment—MD—1942
Cincinnati 6" x 30" Hydraulic—Saddle type—Filmatic bearings—MD—1940 machine
Heald 25A Rotary Hydraulic Surface—30" chuck—24" max. swing—MD
Reid 6" x 18" Horizontal Surface—motor-in-base 1941 machine
Brown & Sharpe #13 Universal Tool & Cutter—motor-in-base—1945 machine
Bridgeport 200" Knife—traveling head—automatic wheel feed—MD—1948 machine

LATHES

Hendey 14" x 30" Geared Head Engine—taper attach.—motor-in-base—late
Betts-Bridgeport 36" x 30' Geared Head Engine—21'7" centers—MD
Niles 42" x 23' Geared Head Engine—10' centers—MD
Morey #2G Back Geared Ram Type Turret—cap. 1" x 6"—bar feed—late type
Cincinnati-Acme 4½" x 17" Universal Turret—cross sliding turret—bar feed—MD

MILLERS

Keller BL2416 Three Dimensional Duplicator—single spindle—angle plate—generator set—MD—1945 machine
Brown & Sharpe #3 Vertical—cap. 34" x 16" x 14"—#50 taper—power rapid traverse—MD
J. T. Burr & Sons Keyway Miller—table 12½" x 8½"—horizontal and vertical spindles—MD—late type

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MODERN MACHINES

Gould & Eberhardt Automatic Gear Hobber Serial #3234, Model 90H—90"
#04 Fellows Gear Shaper, Ser. #26133
#01A Fellows Gear Shaper, Ser. #25034
6' American Radial Drill Ser. #55502
Lodge & Shipley Lathe #29051 18" Jaw Chuck
Reed Prentice Engine Lathe
#00 Hansell Face Grinder
Baush Multiple Spindle Drill, Type W7
6D Potter & Johnson Automatic Chucking Machine
#30 Waterbury Farrell Thread Rollers
16" Gould & Eberhardt Shaper
(2) #3 Cincinnati Miller-Ser. A1604 B
5' Reed Prentice Radial Drill Serial #3121
Onsrud Pin Router—Serial #2525
Rowbottom Cam Miller and Motor

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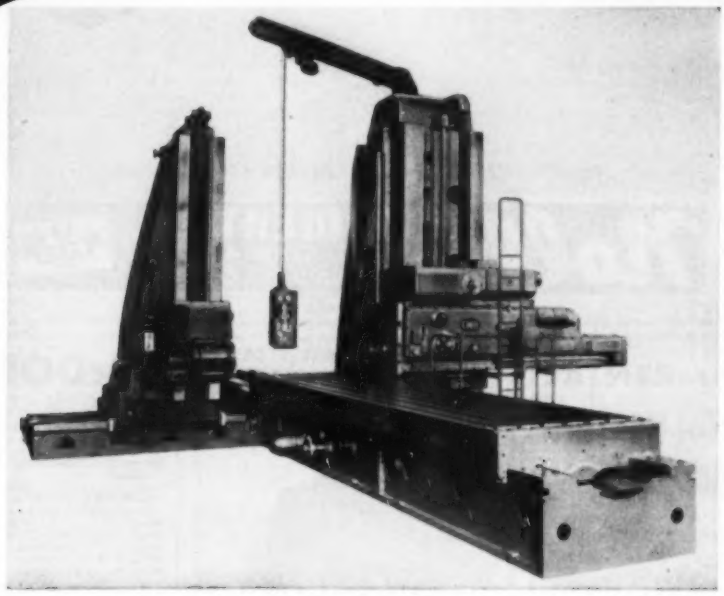

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MISCELLANEOUS MILLS

Brown & Sharpe 3B Horizontal Universal
Brown & Sharpe 4A Horizontal Universal
Cincinnati Duplex 45-48 (Late)
DeVlieg #31 Production Mill 16"x66" Table, 48" Travel
Ingersoll Slab Mill 28"x33" Table
Kempsmith #33 Simplex Table 13"x14"
U. S. Multi-Mill MM1-60 (Latest)
U. S. Multi-Mill MM1-52 (Latest)
Keat Owens #1-B Hydraulic (Latest)
Lees Bradner 40A Thread Mill (Latest)
Lees Bradner HT 12x24 (Latest)
Hansen Whitney Thread Mill 11"
Automatic 16x20 Universal Hob Thread Mill

#08 Cincinnati Vertical Milling Machine
Longitudinal Style Feed, Table working surface 20x6", 8 Spindle speeds 150 — 1300 rpm, Taper hole in spindle No. 40, 8 Power table feeds 1/2-51/2" per minute, Rapid traverse table, Spindle nose to table 8" maximum

#08 Plain Automatic Cincinnati Milling Machine
Table working surface 23-11/16 x 61/2", 10 Spindle speeds 75 to 1100, Taper hole in spindle No. 40, 16 Feeds 1/2-20" per minute, Rapid traverse table 100" per minute, Spindle nose to table 8" maximum.

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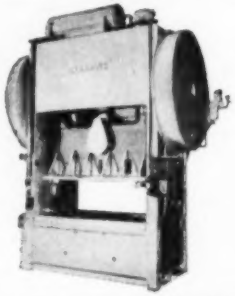

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McDONALD
USED MACHINERY

Norton 6x18" Horiz. Hand Surf. Grinder 1941
Cincinnati No. 3 Hi-Power S.P.D. Vert. Miller.
G & L and Lucas 9" Bar Horiz. Boring Mills.
20" All Grd. Camel Bank Drill 1-Sp. and 4-Sp. Barnes.
Amer. 3' & Morris 3½' Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf. Grinder 20" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1947.
Dual All Steel Press Brakes 6' & 10' 14-Ga. 1947.
Hilles & Jones 12' Pyramid Roll ¾" cap.
Baker No. 1 Vert. Keyseater 1½" cap.
Sheffield Model 101 Thread Grinder 1945.
Nazel #3-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cent. Vert. Miller.
Rock River 100 Ton cap. Horiz. Bulldozer.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #78-A Rod Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
Cochrane-Bly Tool Room Vert. Comb. Miller-Shaper.
P & J #2-M Auto. Prod. Miller, 3 Tables.
Foote-Burt #25 Sen. Col. 1-Sp. Hvy. Drill.
L & N, 8', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 26" stroke openside Shaper Planer.

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No. 2021½ V. & O. Thread Roller.
No. 2C Lewis Short-cut Wire Straightener.

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Planer 48"x48"x12' Gray, Spur Gear Drive.
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Shaper, Planer, 36" Rockford, M.D.
Shear, 140"x¾" E. W. Bliss.

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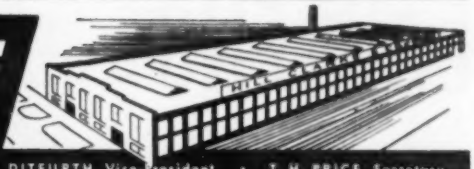

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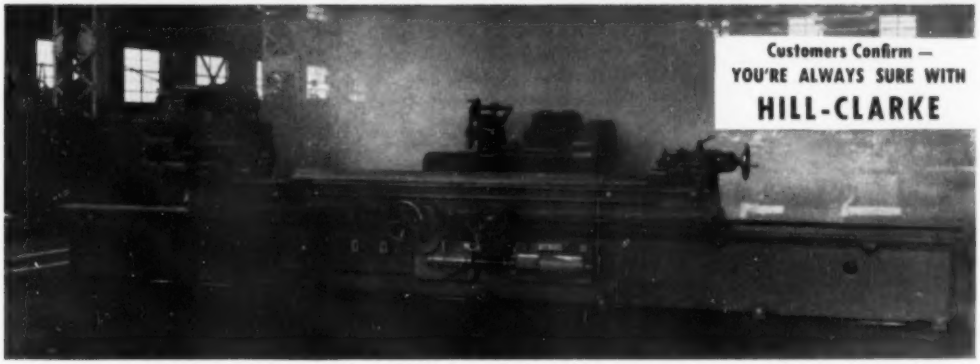

24" SWING x 144" CENTERS NORTON GRINDER GAP 35" SWING x 18¾" WIDE Photographed at our plant where it can be inspected.

AUTOMATICS

⅜" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1 Spdl—24" Sw—No. 2 MA6 Avey.
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey.
D-31 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

No. 12-H Gould & Eberhardt Hobber
No. 12HS Gould & Eberhardt Hobber.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615 Fellows Gear Shaper
No. 65 Fellows—Cone Dr.

BORING MACHINES

72" Niles—Hvy. Pattern

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 81 Heald Int. Cen.-Sizematic
No. 74 Heald Internal Centerless
No. 44 Excello Carbide Tool Gdr.

LATHES

19"x' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 4A Warner & Swasey—7½" Hole —Spdl.

MILLING MACHINES

6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
No. 175 G. T. Schmidt Marking Mach.

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x42"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

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1. Hill-Clarke always give you an unconditional money-back guarantee.
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ENGINE AND PRODUCTION LATHES

1—14" x 54" centers MONARCH Tool Room Lathe, geared head, new 1939-40, taper attachment
1—unused HEID 17" x 78" centers Heavy Duty Engine Lathe, new 1951
1—17" x 100" centers LeBLOND Rapid Production Lathe, new in 1941
1—30" x 14' bed AMERICAN TOOL WORKS Heavy Duty Engine Lathe, taper attachment
24—No. 8 SUNDSTRAND Automatic Lathes, new 1942/1944, 8" x 15" capacity.
7—No. 4 GISHOLT Second Operation Production Forming, Facing and Cut-off Lathes, new in 1947/48, with front and rear slides, hydraulic chucking, spindle hole 4½".
2—GISHOLT SIMPLIMATIC Automatic Lathes, late, with air chucks, 3 tool slides.
2—20" x 25" FAY Automatic Lathes, 1939-40.
1—Model U SENECA FALLS LO-SWING 14" x 24" Automatic Lathe, new in 1940.

TURRET LATHES

1—Model No. 4H-8 LIBBY Heavy Duty Saddle type Turret Lathe, new in 1940, 8¼" hole thru spindle, 32" swing.
1—36" BULLARD, spiral drive vertical turret lathe, new 1940.

AUTOMATICS

1—Model A 9-16" CLEVELAND Single Spindle Automatic, new in 1943.
1—Model A 1-1/16" CLEVELAND Single Spindle Automatic, new in 1940.
1—Model B 1½" CLEVELAND Single Spindle Automatic, new 1943.
1—No. 60 NEW BRITAIN-GRIDLEY 1" Six-spindle Automatic Screw Machine, new 1941, with universal threading spindle, various tooling.

PLAIN & UNIVERSAL MILLING MACHINES

1—No. 12 VAN NORMAN Ram Type Universal Mill, new in 1947.
1—Model 3VG High Speed REED PRENTICE Vertical Mill and Die Sinker, new 1940.
1—Model LT LEES BRADNER 6" x 36" Thread Miller, new 1941.

CYLINDRICAL GRINDERS

1—No. 5 BROWN & SHARPE 3" x 18" plain Grinder, new 1942.
1—10" x 18" NORTON type "C" Plain Grinder, 1942, with mechanical table traverse.
1—14" x 48" CINCINNATI Self-contained Plain Grinder, 1940, with filmatic bearings.

INTERNAL GRINDERS

Several—No. 5B, No. 16 & No. 24 BRYANT Internal Grinders.
1—Model No. 72A-5 HEALD Precision Toolroom Internal Grinder; 1942; with cross sliding headstock.
3—No. 172 HEALD Hydraulic Internal Gap Grinders; new 1941/42; cross sliding and swivel workhead, swing in gap 40".

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MACHINE TOOLS

BORING MILLS

36" BULLARD Vertical Turret Lathe

DRILLS

32" CINCINNATI BICKFORD Upright Drill
ES NATCO Multi Spindle Drill—Hyd. table, 1942
No. 425 BAKER S.S. Heavy Duty Drill
No. 2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

No. 64 FELLOWS Gear Shaper
No. 725A FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 16BM GOULD & EBERHARDT Gear Rougher

LATHES

13"x18" MONARCH "Air Gage Tracer" Mono-Matic Lathe
14"x6' bed HENDEY Mod. ECM, M.D. Eng. Lathe
16"x30" MONARCH Model C Engine Lathe, '47
20"x10' LODGE & SHIPLEY Selective Geared Head Lathe
20"x16' bed AMERICAN "High Duty" Geared Head Lathe.
42"x15' AMERICAN Geared Head Lathe.

GRINDERS

6"x18" LANDIS Type C Plain Grinder
6"x18" CINCINNATI Pl. Saddle Type Grinder
6x18" NORTON Vert. Spindle Surface Grinder
10"x72" LANDIS Type C Hyd. Plain Grinder, '42
#10M RIVETT Internal External Grinder
10-28 BRYANT Hyd. Internal Grinder
#73 HEALD Internal Centerless Grinders
TG-105 J&L Internal Thread Grinder
#55 HEALD Cylinder Grinder
10"x26" LANDIS Universal Grinder

MILLERS

No. 0-8 CINCINNATI (OT) Vert. Milling Machine
4½"x30" P&W Model C Thread Miller
#1 - 8 KENT OWENS M.D. Prod. Miller Model MMS U.S. Multi-Miller
#4 CINCINNATI High Power Vertical Miller.

AUTO. LATHES & TURRETS

No. 4D & 6S P&J Auto. Lathes
Nos. 3 JONES & LAMSON Ram Type Univ. Turret Lathe
No. 1H5 LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1950

MISCELLANEOUS

No. 2 B&S Wire Feed Hand Screw Machine
15" BETTS Vertical Slotter
½ B P&W 2-spindle Reaming Machine
6" TAYLOR & FENN Spline Miller
20" CINCINNATI Hand Feed Rotary Table
P&W Upright Shaving Machine
24x24x6' GRAY Double Housing Planer
24" CINCINNATI Standard Universal Shaper
28" MORTON Draw Cut Shapers

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AUTOMATICS, Nos. 00G & 2G B. & S., '50
AUTOMATIC, 1¾" 4 spin. Gridley Model G
BOLT THREADERS, 1½" Williams Reliance
BOLT THREADER, 2" Landis, 2 Hds., M.D.
BORING MILL, 100" Cinc. Monsive, 3 Hds., M.D.
BORING MILL, 60" Colburn PRT, 2 Hds. M.D.
BORING MILL, 72" King, 2 Hds., P.R.T., M.D.
BORING MILL, 5" bar Betts Floor Type, with 9'x16' plate
BORING MILL, 4½" bar Lucas #33 Tblr.
BORING MILL, 4½" bar P. & H. 29 Floor Type
BORING MACH., 3" Bar Lucas & Lambert (2)
DRILLS, RADIAL, 4' Western, M.D. (2)
8' Amer. 13" col. Trip. Purp., M-on-arm
6'15" col. Carlton, M-on-arm, Late
5' Amer. 15" col. Trip. Purp. M-on-arm
5 Niles #10 Rightline, Univ., Motor on arm
5' Amer. 14" col. Trip. Purp.
TABLES, RADIAL 30"x20"x20"
DRILL, 24" Cinci. Bick., Tapping, M.D.
DRILL, No. 121 Baker, M.D.
DRILL, 16 Spin. Natco, C15-R
DRILLS 21" Reynrafed Excelsior M.D. New
GEAR HOBBER, No. 12 Barber Colman
GEAR HOBBER, No. 96H Gould & Eberhardt
GEAR PLANERS, 11" Rissecker Bevel
GEAR SHAPERS, No. 0, 04A, 04 & 01A
GEAR SHAPER, No. 75 Fellows
GEAR CUTTER, No. 15 B. & S. Spur & Bevel
GRINDER, FACE, 24" Builders, 40 h.p.
GRINDER, 16Y48 Bryant Int., 1943
GRINDER, Micro Internal, large capty.
GRINDER, No. 73A Heald Internal
GRINDER, SURFACE 14"x30" P. & W.
GRINDER, No. 6T Sellers Tool 1942
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
LATHES, 48"x20' bed, Amer. T.A. Grd. Hd.
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26/46"x24' bed McCabe, Dble. Spin. M.D.
24/40"x16' bed Fay & Scott Gap M.D.
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32"x14' bed Monmouth Boyar T.A., M.D.
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18"x8' bed L. & S. Selective Grd. Hd., M.D.
16"x8' & 12"x8' Hendeys (2)
14"x30" con. Monarch T.A., 16½" sw.
14"x6' bed, Amer. T.A., M-in-base
TURRET LA., 21" Acme Universal Brass, late
TURRET LA., 18" Libby Model A Grd. Hd.
No. 2B Foster Univ., 3¼" capty., Bar Timkon
No. 1B Foster Univ., 2" capty. M.D.
No. 6B1 Oster 1½", New
No. 1AL Gisholt, 6½" H.S.
No. 3 Gisholt, '42 (5)
MILLER, No. 5-48 Cinci. Hydromatic Pl. M.D.
THREAD MILLER, 12"x90" Worsy Shields '42
MILLER, No. 4B B. & S. Plain M.D.
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MILLER, No. 1½ B K. & T. Univ., Grd. Hd.
MILLER, No. 3 Cinci. HI Power, Motorized
MILLER, No. 4 Cinci. Univ. HI Power, M.D.
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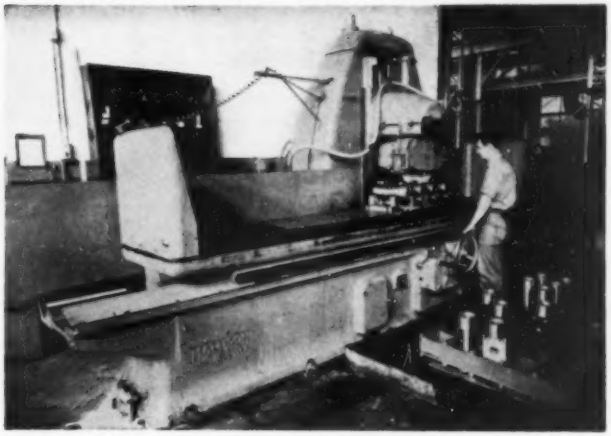

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ATLAS CLAUSING, 12x36
POTTER & JOHNSON No. 5D, 2E, 15
REED PRENTICE, 18"x96"

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NATCO, Mod. C

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LIBBY No. H5, Late
GISHOLT No. 3L, Taper attch., BF, Cross Slide Turrets, 1936
WARNER SWASEY 4A Chucker, Ser. #298000
2—FOSTER Fastermatic, No. 4FU

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WARNER SWASEY No. 1A, BF & CH. Pres., Ser. #481170
HARDINGE Type B, Ser. #59-19834-1
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GISHOLT No. 5, Univ.
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SUNDSTRAND No. 2 Electromil
KEMP No. 2G, Univ., 1943
KEMP No. 2G, Plain, 1943
INGERSOLL Duplex, 24"x36", 1942
CINCINNATI No. 2-24, R & F

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JOHNSON No. 55, 4" Stroke, 56 T, Back Geared, New
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SHERIDAN, Upstroke platen, 500 T
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HEALD No. 22 Rot. Surf., 1942
NORTON 10"x18" Cyl. Oscil. Spdl., 1943
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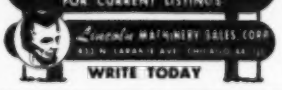

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Index of

PRODUCTS ADVERTISED

In This Issue

•

Abrasives, Coated ... 18-19, 68-69, 174

Accessories & Attachments (Machine Tool) ... 74, 157, 158-159, 160, 207, 221, 224, 238, 255, 265, 266, 294

Balancing Machines ... 56

Balers, Scrap Metal ... 233

Bearings ... 28, 204

Bending Machines ... 239, 299

Books, Technical ... 249

Boring, Drilling & Milling Machines (Horizontal) ... 14-15, 38-39, 51, 220, 268, 294

Boring Machines Internal ... 2nd Cover

Boring & Turning Machines (Vertical) ... 14-15

Broaching Machines ... 4-5, 42

Cams ... 260

Castings ... 208

Centering Machines ... 230, 265

Chucks ... 58, 230

Cleaning & Drying Machines & Supplies ... 202

Collets ... 57

Controls, Electrical ... 235

Coolant Systems, Filters & Supplies 270

Cut-Off Machines; Sawing Machines ... 98, 157, 158-159, 160, 237, 247, 275, 297, 300

Die Sets ... 82

Disintegraters, Metal ... 292

Dressers, Grinding Wheel ... 226

Drilling Machines ... 3rd Cover, 27, 29, 40-41, 43, 60, 64, 72, 79, 131, 134, 223, 238, 244, 252, 261, 292, 298

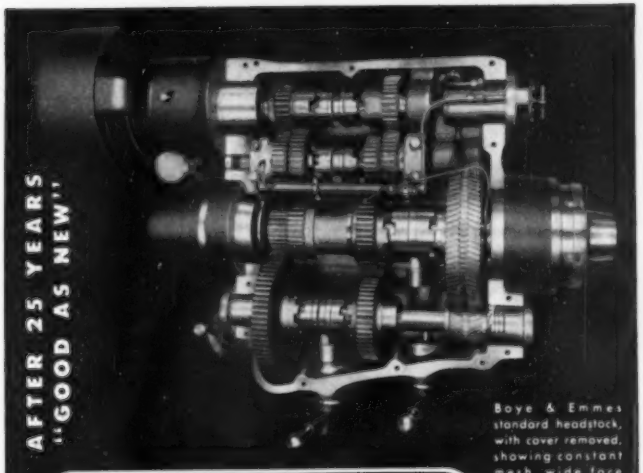
Drill Jig Bushings ... 169

Duplicators & Pantographs ... 24-25, 38-39, 51, 66

Electro Plating & Polishing Equipment & Supplies ... 185

Engineering & Production Services ... 182, 237, 296

(Continued on page 292)



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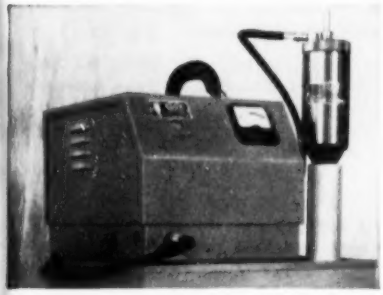

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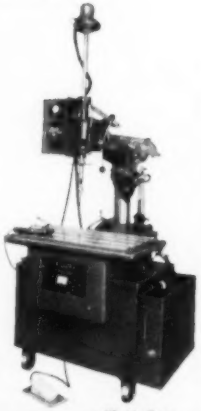

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Index of PRODUCTS ADVERTISED In This Issue

(Continued from page 291)

Fabricating Methods & Services 224
Fasteners 190, 232, 252, 262
Forgings 136, 199

Gages & Instruments 16, 31, 132, 157, 158-159, 160, 181, 206, 212-213, 230, 238, 242, 255, 256, 260, 262, 266, 275
Gear Cutting Machines 3, 6-7, 214, 252
Gears, Speed Reducers, Motor Reducers 161, 210, 227, 258, 259, 260
Gear Testers 3, 6-7, 258, 259, 260
Grinders—Cutter & Tool 12-13, 80, 173, 188, 230, 256, 262, 274
Grinding Machines—Production 4-5, 12-13, 30, 167, 173, 230, 262, 267
Grinding Wheels 18-19, 37, 68-69, 80, 174, 191, 192, 216

Heads: Drilling, Grinding & Tapping—10-11, 193, 194, 238, 275
Heat Treating Equipment & Supplies 44, 176, 232, 296
Honing Machines 77, 195, 244
Hydraulic & Pneumatic Parts & Equipment 198, 218, 224, 241, 273

Jig Borers 265, 299

Lathes, Automatic 22-23, 56, 59, 163
Lathes, Engine 24-25, 51, 63, 66, 81, 211, 217, 232, 240, 264, 270, 291
Lathes, Turret 22-23, 56, 59, 75
Lubricants, Cutting Fluids, Quenching Oils & Solvents 159, 177, 197, 209, 229, 231, 246, 253
Lubricating Systems & Equipment 153

Machines, Super Finishing 56
Marking Machines, Tools & Supplies 78, 234, 272, 275
Materials-Cutting & Forming 4th Cover, 157, 158-159, 160, 249

Index of

PRODUCTS ADVERTISED

In This Issue

Materials of Manufacture 36, 138, 184, 187, 189, 219, 236, 263
Materials Handling Equipment 183, 224
Mechanical Parts & Equipment 74, 221, 294
Millers, Die Sinkers, Profilers 8-9, 20-21, 225, 244
Molds 262
Motors, Electrical 52-53, 67, 165

Planers 14-15, 268
Power Transmission 17, 32, 222, 248
Presses, Forging & Forming Equipment & Supplies 26, 34-35, 61, 175, 182, 190, 203, 218, 223, 224, 228, 238, 243, 250, 252, 271, 273, 295, 299
Pumps, Circulating 186, 241, 270

Riveting Machines 262
Rust Preventives 171

Saw Blades 157, 158, 159, 160, 205, 236, 238, 254, 262, 293
Screw Machines; Chucking Machines 51, 71, 73, 200
Shafting, Flexible 178-179
Shapers, Slotters, Keyseaters 98, 230
Special Machine Tools 237, 247
Stampings 180

Tapping Attachments 196
Tapping Machines 22-23, 40-41, 196, 244
Tools, Cutting 42, 54-55, 62, 70, 76, 178-179, 193, 194, 207, 212-213, 215, 236, 252, 262, 272
Tools, Hand 251
Transportation 33

Universal Joints 198
Used & Surplus Equipment 276-290

Vises 254

Welding & Cutting, Brazing & Soldering Equipment & Supplies 65, 201, 245, 273

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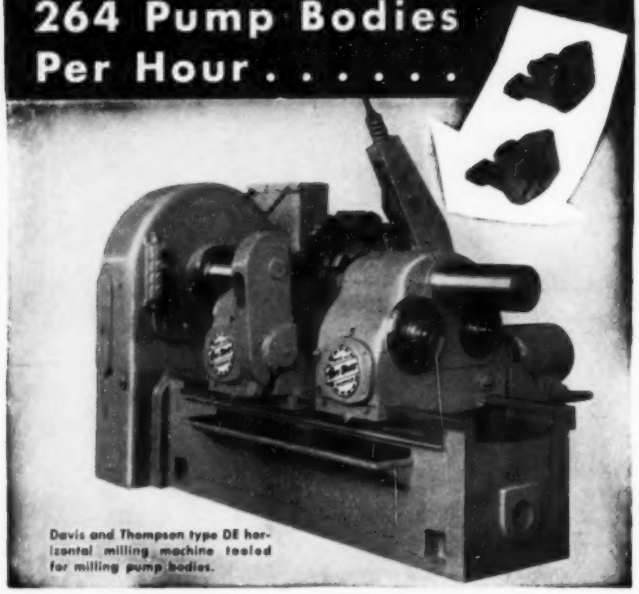

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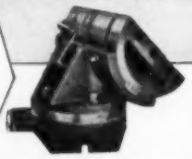
BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool that Holds Work at Any Desired Angle.



Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Made in several stock sizes.

Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc.

40 ARBORETUM ROAD · BOSTON 31, MASSACHUSETTS

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

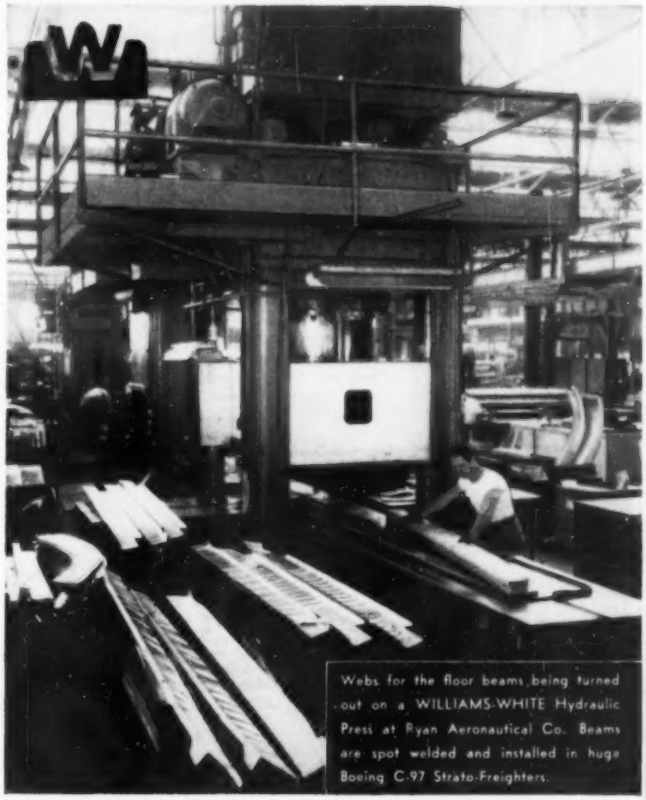
	Page
Acme Gear Co.	258
Acromark Co.	275
Adams Co.	258
Air Reduction	273
Alemite	153
Allis-Chalmers Mfg. Co.	32
Alvord Polk Tool Co.	252
American Brass Co.	189
American Broach & Machine Co.	42
American Gear & Mfg. Co.	259
American Machine & Foundry Co.	254
American Machinist 45, 46, 47, 48, 49, 50	
American Saw & Mfg. Co.	254
American Tool Works	29
American Welding & Manufacturing Co.	201
Armco Steel Corp.	138
Armstrong-Blum Mfg. Co.	262
Armstrong Bros. Tool Co.	74
Atlantic Gear Works Inc.	260
Atlas Press Co.	223
Automatic Valve Co.	224
Automotive Gear Works Inc.	227
Axelson Mfg. Co.	217
Baker Bros., Inc.	261
Baldwin-Lima-Hamilton Corp.	268
Blair Tool & Machine Corp.	260
Blake Co., Edward	256
Blanchard Machine Co.	30
Boyar-Schultz Corp.	230
Boye & Emmes Machine Tool Co.	291
Brown & Sharpe Mfg. Co.	58
Bryant Machinery & Engineering Co.	43
Buffalo Forge Co.	298
Bullard Co.	75
Capitol Machinery Corp.	238
Carboloy Dept. of General Electric Co. (Press Dies)	271
Carboloy Dept. of General Electric Co. (General Tools)	54-55
Carborundum Co.	68-69
Carlton Machine Tool Co.	88
Carpenter Steel Co.	249
Carroll & Jamieson Machine Tool Co.	232
Century Electric Co.	165
Chandler Tool Co.	238
Chase Brass & Copper Co., Inc.	36
Chicago Screw Co.	232

INDEX TO ADVERTISERS

	Page
Chicago Wheel & Mfg. Co.	192
Cincinnati Bickford Tool Co.	79
Cincinnati Gear Co.	260
Cincinnati Gilbert Machine Tool Co.	3rd Cover
Cincinnati Lathe & Tool Co.	72
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. (Grinding Wheels Division)	37
Cincinnati Mil'ing Machine Co. (Hydroform Division)	34-35
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	98
Circular Tool Co.	236
Cities Service Oil Co.	177
Clearing Machine Corp.	243
Cleereman Machine Tool Co.	43
Clemson Bros., Inc.	293
Cleveland Crane & Engineering Co.	300
Cleveland Tapping Machine Co.	196
Cleveland Twist Drill Co.	70
Climax Molybdenum Co. of New York	236
Coffing Hoist Co.	183
Columbus Die Tool & Machine Co.	224
Comtor Co.	238
Cone Automatic Machine Co.	71
Cross Co.	131
Curtis Universal Joint Co.	198
Dake Engine Co.	228
Danly Machine Specialties, Inc.	82
Davis & Thompson Co.	294
Davis Keyseater Co.	230
Delco Products Div. General Motors Corp.	67
Delta Power Tool Division Rockwell Mfg. Co.	173
Dempster Brothers, Inc.	233
Denison Engineering Co.	203
Derbyshire Inc., F. W.	270
DoAll Co.	157, 158-159, 160
Dow Chemical Co.	184
DuPont de Nemours & Co., Inc., E. I. Electrochemicals Dept.	229
Earle Gear & Machine Co.	260
Eastern Machine Screw Corp.	275
Eastman Kodak Co.	181
Electro-Lift Inc.,	224
Elox Corporation of Michigan	292
Erie Foundry Co.	136
Etna Machine Co.	61
Ex-Cell-O Corporation	85

(Continued on page 296)

Wings for an Air Freighter . . . .
on a **WILLIAMS-WHITE PRESS**



Webs for the floor beams being turned out on a WILLIAMS-WHITE Hydraulic Press at Ryan Aeronautical Co. Beams are spot welded and installed in huge Boeing C-97 Strato-Freighters.

Write for FREE Catalog of typical production machines

Whatever size job you may have . . . for defense or commercial production . . . there is a WILLIAMS-WHITE machine to meet your needs. Every WILLIAMS-WHITE machine is a custom built job, tailored to your individual needs. All over America they are meeting the demand for production.

ESTABLISHED IN 1854

MAKERS OF QUALITY PRODUCTION MACHINERY FOR NEARLY 100 YEARS

WILLIAMS-WHITE & CO.

MOLINE, ILLINOIS

STANDARDIZE

with

WESPO

STANDARD FIXTURE PARTS and FITTINGS

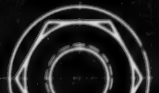
★ ★ ★

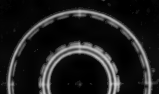
The cut shows a few of the 350 parts and fittings which are used by leading manufacturers to save time and money formerly spent in designing and machining.

WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are made for heavy duty and long usage and have proved their value in many industries.

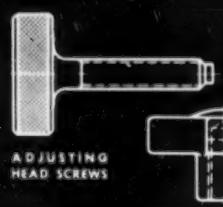
OVER 350 PARTS AVAILABLE

This wide variety of types and sizes makes it easy to use WESPO parts for almost any of your fixture needs. TEMPLATE DRAWINGS OF ALL PARTS ON REQUEST. Write for catalog.





WEST POINT MFG. CO.
26933 West 7 Mile Road
Detroit 19, Michigan



TEMPLATE DRAWINGS OF ALL PARTS FREE

Gas Fired FURNACES

No Blower or Power Needed FOR TEMPERATURES TO 2400° F.

Just connect the BUZZER High Speed Muffle Furnace to your gas supply and it is ready for use. A temperature of 2400° F. is attainable in approximately 1½ hours. Special block for controlled furnace atmospheres make this furnace particularly adaptable for high carbon and alloy steels. Special BUZZER burners have wide range of control.

Send today for catalog showing this furnace in bench and floor models, as well as other types of furnaces, burners and other equipment.

CHARLES A. HONES, INC.
121 South Grand Avenue Baldwin, L. I. N. Y.

INDEX TO ADVERTISERS

(Continued from page 295)

	Page
Fafnir Bearing Co.	204
Farrel-Birmingham Co., Inc.	161
Federal Products Corp.	257
Fellows Gear Shaper Co.	6-7
Ferracute Machine Co.	250
Foote Gear Works, Brad	259
Foote-Burt Co.	134
Fosdick Machine Tool Co.	27
Frauenthal Inc., A. Harold	167
Fulmer Co., C. Allen	195
Gallmeyer & Livingston Co.	262
Gates Rubber Co.	248
General Electric Apparatus Dept.	52-53
Geroter May Corp.	241
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	56
Gleason Works	3
Goss & de Leeuw Machine Co.	200
Grant Gear Works	258
Grant Mfg. & Machine Co.	262
Greenfield Tap & Die Corp.	193-194
Greer Stop Nut Co.	190
Grinding Wheel Institute	216
Griswold Mfg. Co., F. T.	266
Grob Brothers	275
Gulf Oil Corp.	231
Hamilton Tool Co.	214
Hardinge Brothers, Inc.	57
Heald Machine Co.	2nd Cover
H.E.B. Machine Tools, Inc.	66
Hebert Equipment Co.	230
Heimann Mfg. Co.	262
Hendey Machine Co.	264
Henry & Wright Div. Emhart Mfg. Co.	252
Hisey Wolf Machine Co.	274
Hones, Inc., Charles A.	296
J & S Tool Co.	226
Jarvis Co., Charles L.	178-179
Jones & Lamson Machine Co.	31
Kearney & Trecker Corp.	20-21
Kent-Owens Machine Co.	225
Kitzman Mfg. Co.	262
Knapp Co., Inc., James H.	232
L & J Press Corp.	190
Laminated Shim Co., Inc. Shim Div.	180
Landis Machine Co.	10-11
Landis Tool Co.	12-13
Lavallee & Ide Inc.	76
LeBlond Machine Tool Co., R. K.	24-25
Lehmann Machine Co.	211

INDEX TO ADVERTISERS

	Page
Leland-Gifford Co.	252
Link-Belt Co.	17
Linley Brothers Co.	299
Lodge & Shipley Co.	63
Luers, J. Milton	238
Madison Mfg. Co.	215
Massachusetts Gear & Tool Co.	210
Mattison Machine Works	267
McGraw-Hill Book Co., Inc.	240
McKay Co.	237
Metal Carbides Corp.	207
Michigan Tool Co.	90-91
Micromatic Hone Corp.	77
Moline Tool Co.	244
Monarch Machine Tool Co.	81
Moore Special Tool Co., Inc.	265
Morey Machinery Co., Inc.	244
Morris Machine Tool Co.	96
Motch & Merryweather Machinery Co.	247
National Acme Co.	73
National Automatic Tool Co.	40-41
National Machinery Co.	175
New Britain Gridley Machine Co.	51
Nicholson & Co., W. H.	198
Nicholson File Co.	251
Noble & Westbrook Mfg. Co.	78
Norton Company	18-19
Oakite Products Inc.	202
Ohio Crankshaft Co.	65
Oliver Instrument Co.	188
Orban Co. Inc., Kurt	64
Parker Rust Proof Co.	171
Parker Stamp Works Inc.	272
Pines Engineering Co. Inc.	239
Pioneer Engineering & Mfg. Co.	186
Pioneer Pump & Mfg. Co.	186
Pittsburgh Gear Co.	259
Potter & Johnston Co. Sub. Pratt & Whitney Div. Niles-Bement-Pond Co.	59
Pratt & Whitney Div. Niles-Bement-Pond Co.	38-39, 212-213
Pure Oil Co.	209
Railway Express, Air Express Div.	33
Randall Co., Inc., Frank E.	230
Reltool Corp.	272
Republic Steel Corp.	219
Robertson Mfg. Co.	191
Rodgers Hydraulic Inc.,	218
Ruthman Machinery Co.	270

(Continued on page 298)

ARE YOU WASTING DOLLARS TRYING TO SAVE PENNIES ON CUT-OFF JOBS?

Wells No. 8 with wet cutting system.

A Wells Metal Cutting Band Saw pays for itself in savings . . . and you get greater accuracy, greater dependability

IT'S easy to fool yourself when you figure the costs on your cut-off jobs—perhaps you say like so many, "It doesn't amount to much, so why worry about how we do it." You'd be surprised. Just look at what a Wells Saw gives you—Modest first cost with a model for every budget . . . Rugged, heavy duty construction for minimum "cost per year of life" . . . Fast, continuous band saw cutting . . . Accurate cutting to minimize subsequent machining . . . Simple operation requires no special skill and will cut without attention once it is started.

Check your present cut-off methods against these advantages and we think you'll see how you can slash your cut-off costs and start saving those dollars that are being wasted. Ask your Wells Distributor for further information or write direct.

Standard Wells Saws are available in the following capacities: No. 49A —3½" x 6⅝"; No. 5—5" x 10"; No. 8—8" x 16"; No. 12—12" x 16". Wet cutting systems available for Nos. 5, 8 and 12. Automatic bar feed available for Nos. 8 and 12. Special machines for capacities to 48" x 48".

Wells SAWS

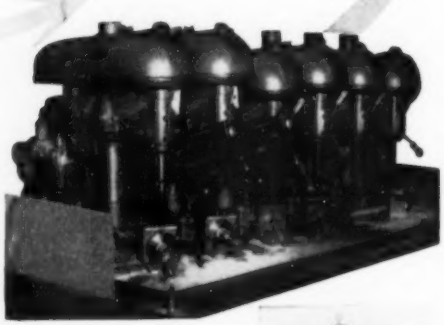
Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICHIGAN

"Buffalo" DRILLS with pneumatic feed and air clamps result in 17% time saving



A special adaptation of "Buffalo" Multiple Spindle No. 15 Drills in drilling four small holes in a forged brass piston is shown here, in operation at *New York Air Brake Co.*, Watertown, N. Y. 0.070", 1.082", 0.76" and 1 52" diameter holes are drilled consecutively with the first four spindles. The work pieces are held on the jigs by ingenious air clamps, devised by the user. This permits quick placement and quick release of the work, effecting a 17% time saving. Here is an application calling for accurate, rigid drills with precision-built spindles—the way all "Buffalo" Drills are constructed.

The "Buffalo" No. 15-M Single Spindle Manufacturing Drill at right is built for continuous production work up to ½". Write for Bulletin 2963-F for facts on these rugged, versatile production machines.

"Buffalo" MACHINE TOOLS

DIAMOND JUBILEE 75th ANNIVERSARY

BUFFALO FORGE COMPANY

309 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

INDEX TO ADVERTISERS

(Continued from page 297)

	Page
Sales Service Machine Tool Co.	182
Scherr Co. Inc., George	260, 262
Schmidt Inc., George T.	234
Sciaky Bros. Inc.	245
Sebastian Lathe Div. of Metalcrafts Inc.	240
Seneca Falls Machine Co.	163
Severance Tool Industries Inc.	262
Sheffield Corp.	86
Shell Oil Co.	253
Shore Instrument & Mfg. Co. Inc.	260
Simonds Abrasive Co.	174
Sonoflux Corp.	242
South Bend Lathe Works	234
Square D Co.	235
Starrett Co. L. S. The	132
Steelweld Machry Div. Cleveland Crane & Engineering Co.	300
Stewart Warner Corp.	153
Stokvis Edera & Co. Inc.	220
Strong Carlisle & Hammond Co.	252
Stuart Oil Co. D. A.	246
Superior Steel Corp.	263
Surface Combustion Corp.	176
Taft Peirce Mfg. Co.	255
Texas Co.	92
Thompson & Son Co., Henry G.	205
Tide Water Associated Oil Co.	197
Timken Roller Bearing Co. Steel & Tube Div.	4th Cover
Tomkins Johnson Co.	95
Torrington Co.	28
Tube Making Machines, Ltd.	299
Union Twist Drill Co.	62
Unitcast Corp.	208
U. S. Automatic Box Machinery Co.	294
U. S. Rubber Co. (Mechanical Goods)	222
Universal Engineering Corp.	169
Utica Drop Forge & Tool Corp.	199
V & O Press Co. Div. Embart Mfg. Co.	231
Van Keuren Co.	16
Van Norman Co.	8-9
Waldes Koh-I-Noor Inc.,	221
Walker Co. Inc., O. S.	230
Walker-Turner Div. Kearney Trecker Corp.	60
Waltham Machine Works	252
Ward Leonard Electric Co.	185
Warner & Swasey Co.	22-23
Webber Gage Co.	206
Wells Mfg. Co.	297

INDEX TO ADVERTISERS

	Page
Westinghouse Electric Corp. Electronic & X-Ray Div.	44
West Point Mfg. Co.	296
Wickman Manufacturing Co.	80
Williams-White & Co.	295
Wilson Mechanical Instrument Co.	275
Wilson Co., K. R.	26
Youngstown Sheet & Tube Co.	187

SEARCHLIGHT SECTION
(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
- Positions Vacant 275, 290
- Selling Opportunities Offered 275
- Positions Wanted 275
- Employment Services 275

SPECIAL SERVICES
- Contract Work 290
- General Pattern Works 290
- Steel-Bath Gear & Pump Co., Inc. 290

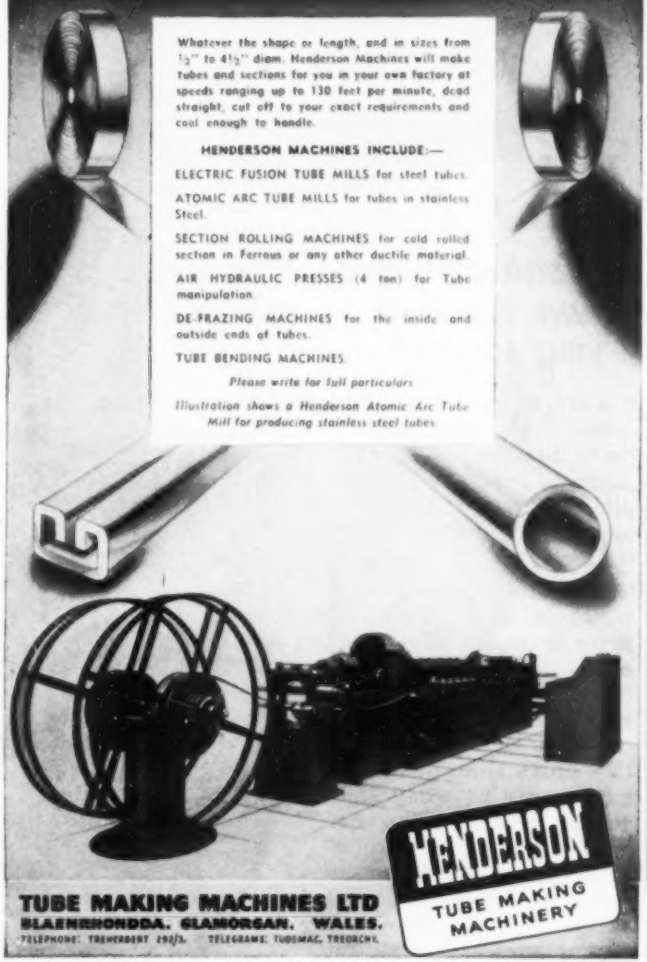
BUSINESS OPPORTUNITIES
- Offered 275

EQUIPMENT
(Used or Surplus New)
- For Sale 276-290

ADVERTISERS INDEX

Aaron Machinery Co. 281
Alexander & Fiden Machinery Co. 290
Amco Machinery Co. 290
Behr & Sons, Inc., Joseph 289
Bennett Machinery Co. 288
Boice-Crane Co. 290
Botwinik Bros. of Mass. 284
Brownell Machine Tools, Inc. 284
Connell Machinery Co. 282
Cincinnati Machinery Co. 284
Cowden Machinery Co., W. C. 290
Currier Machine Sales 288
Dony Machinery Co., D. E. 286
Drake Personnel 275
Eastern Machinery Co. 282
Falk Machinery Co. 277
Foster Machinery Sales Co. 290
Goldman & Co., Harvey 280
Hill-Clark Machinery Co. 287
Hoy, L. S. 284
Hyman & Sons, Joseph 286
Indianapolis Machinery & Supply Co. 280
International Merit Products Corp. 285
Kaiser-Frazer Corp. 290
Kings County Machinery Exchange 280
Laurens Brothers, Inc. 288
Lincoln Machinery Corp. 290
Machinery Rentals, Inc. 276
McDonald Machinery Co. 286
Meyer, Machinery & Equip. Co., W. H. 290
Miles Machinery Co. 278
Mitchell Machine Co. 290
Morey Machinery Co. 283
National Machinery Exchange 282
New Rochelle Tool Corp. 286
Noll Equipment Co. 286
O'Connell Machinery Co. 278
Osborne & Sexton Machinery Co. 282
Raytheon Manufacturing Co. 275
Smith Machinery Sales, Ed. 280
Surplus Machine Tool & Equipment Co. 288
Tripler Machine Tool Corp. 279
U S Industrial Tools 284
West Penn Machinery Co. 286
Wigglesworth Industrial Corp. 288
Williams, Edward Hale 290
Winston Machinery Co. 278, 282, 286, 290

Make your own tubes & sections



Whatever the shape or length, and in sizes from ½" to 4½" diam. Henderson Machines will make tubes and sections for you in your own factory at speeds ranging up to 130 feet per minute, dead straight, cut off to your exact requirements and cool enough to handle.

HENDERSON MACHINES INCLUDE:—

ELECTRIC FUSION TUBE MILLS for steel tubes.

ATOMIC ARC TUBE MILLS for tubes in stainless Steel.

SECTION ROLLING MACHINES for cold rolled section in Ferrous or any other ductile material.

AIR HYDRAULIC PRESSES (4 ton) for Tube manipulation.

DE-FRAZING MACHINES for the inside and outside ends of tubes.

TUBE BENDING MACHINES.

Please write for full particulars.

Illustration shows a Henderson Atomic Arc Tube Mill for producing stainless steel tubes.

TUBE MAKING MACHINES LTD
BLAENRHONDDA, GLAMORGAN, WALES.
TELEPHONE: TREHERBERT 295/5. TELEGRAMS: TUBEMAC, TREORCHY.

HENDERSON
TUBE MAKING MACHINERY

for **SMALL JIG BORING**

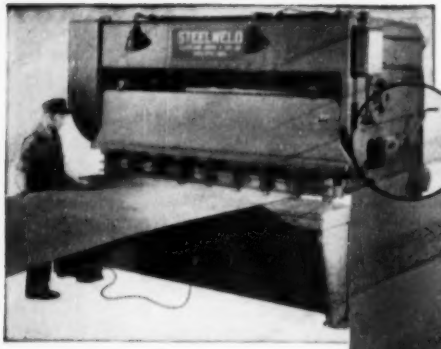
PUT SMALL JOBS ON THIS **LINLEY MACHINE**

and save your larger machines for heavier work.

YOU'LL BE SURPRISED! at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7' x 17½" table size.

Write TODAY for Full Information

LINLEY BROTHERS COMPANY
664 STATE ST. EXT., BRIDGEPORT 1, CONN.



THE *Right* KNIFE CLEARANCE FOR EVERY PLATE THICKNESS

ONLY STEELWELD SHEARS HAVE THIS SIMPLE KNIFE ADJUSTMENT

It is simple, fast and easy to adjust the knife clearance on a Steelweld Pivoted-Blade Shear to suit every plate thickness. No bolts to loosen! No bed to move! No feeler gauges required!

Only turn a crank and watch a dial. That's all there is to it. The large easily-read dial indicates the clearance between knives in thousandths of an inch and also shows the plate thickness that may be cut with any knife setting. Because of the ease with which knife adjustments are made, every cut made on Steelweld Shears is the best cut possible—straight, smooth, accurate. And of importance, knives remain sharper for longer periods.

Steelweld Shears are built for thicknesses of 12 gauge to 1¼ inch and for lengths of 6 to 18 feet.

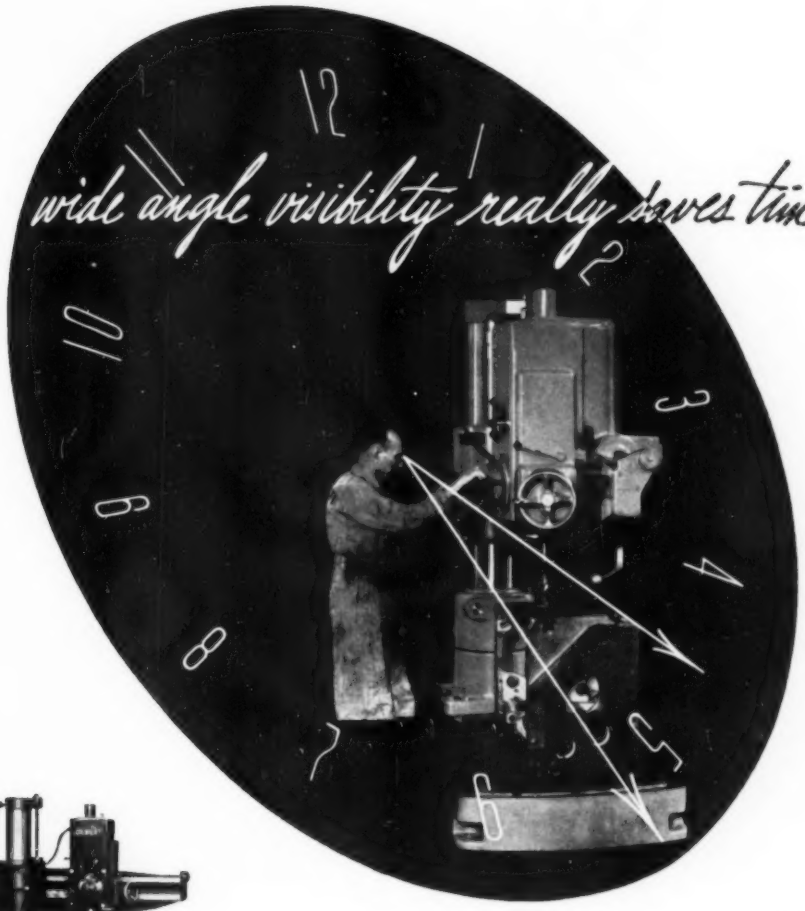
GET THIS BOOK!

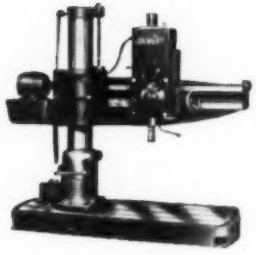
CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1411 EAST 282ND STREET, WICKLIFFE, OHIO.

STEELWELD PIVOTED BLADE SHEARS

wide angle visibility really saves time





'Round the clock — day after day — time savings pile up with Gilbert radial "comfort-level" operation. The operator can put the arm down (for comfort as well as minimized deflection) and still have full view of the work because (1) the spindle is close to the arm and to the front face of the head and (2) the bottom of the head extends only a short distance below the lower vee of the arm. All controls are *right at hand*, easy to reach and finger-tip sensitive, keep fatigue *down*, production *up*.

Minimum of gearing from motor to spindle minimizes wear, helps sustain original accuracy for years on end. Write for Bulletin 349 or better still, call your Gilbert representative. Next time, buy Gilbert.

THE CINCINNATI

GILBERT

MACHINE TOOL COMPANY

3366 BEEKMAN STREET • CINCINNATI 23, OHIO

those who buy Gilbert buy Gilbert again

GAGE USERS REPORT GRAPH-MO® OUTWEARS OTHER TOOL STEELS 3 TO 1!

Reports from gage users who have switched to Graph-Mo® steel gages show that Graph-Mo outwears other tool steels an average of three to one!

Graph-Mo wears better because it contains free graphite and diamond-hard carbides. This structure gives excellent resistance to abrasion and has minimum tendency to pick up, scuff, or gall. Tests on Amsler Wear Machine show Graph-Mo has twice the resistance to galling when compared with ordinary tool steels.

MACHINES FASTER

Constant Pressure Machinability tests show that Graph-Mo machines 30% faster than other tool steels. This is due to Graph-Mo's graphitic particles—a feature which is exclusive with Graph-Mo.

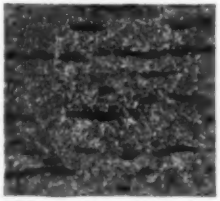
Measuring Graph-Mo steel master plug gage in 12-year stability test. Gage changed only 10 millionths.

GREATER STABILITY, TOO!

During a twelve-year period, the Timken Company measured at frequent intervals a typical master plug gage made of Graph-Mo. As shown by the figures below, the gage size at the end of that time measured within ten millionths of an inch of its original dimension.

1940—1.73996	*1944*—1.73996
1941—1.73995	*1945*—1.73995
1942—1.73998	*1948*—1.73997
1943—1.73997	*1951*—1.73995

You can always tell Graph-Mo by its "graphitic look"—the tiny, scattered, parallel marks barely visible on the surface of a piece of polished Graph-Mo. This built-in "trade-mark", the result of free graphite in its structure, can't be duplicated in other steels. Look for it, insist upon it, next time you buy gages.

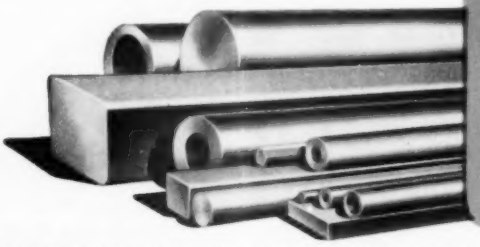


100X

Photomicrograph shows graphitic particles in Graph-Mo steel.

For further information on Graph-Mo—a Timken graphitic tool steel—write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



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